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TEMATSKI ZBORNIK RADOVA MEĐUNARODNOG ZNAČAJA

INTERNATIONAL SCIENTIFIC CONFERENCE “ARCHIBALD REISS DAYS”
THEMATIC CONFERENCE PROCEEDINGS
OF INTERNATIONAL SIGNIFICANCE

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“ARCHIBALD REISS DAYS”

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PREFACE

Dear readers,

In front of you is the Thematic Proceedings of the International Scientific Conference "Archibald Reiss Days 2013", which was organized by the Academy of Criminalistic and Police Studies, with the support of the Ministry of Interior and the Ministry of Education, Science and Technological Development of the Republic of Serbia, and held at the Academy of Criminalistic and Police Studies.

The International Scientific Conference "Archibald Reiss Days", is held for the third time in a row, in memory of one of the founders and directors of the first modern police high school in Serbia, Dr. Rodolphe Archibald Reiss, after whom the Conference was named.

The Thematic Conference Proceedings contains 138 papers written by eminent scholars in the field of law, security, criminalistics, police studies, forensics, medicine, as well as members of national security system participating in education of the police, army and other security services from Russia, Ukraine, Belarus, China, Poland, Slovakia, Czech Republic, Hungary, Slovenia, Bosnia and Herzegovina, Montenegro, Republic of Srpska and Serbia. Each paper has been reviewed by two competent international reviewers, and the Thematic Conference Proceedings in whole has been reviewed by five international reviewers.

The papers published in the Thematic Conference Proceedings contain the overview of contemporary trends in the development of police educational system, development of the police and contemporary security, criminalistics and forensics, as well as with the analysis of the rule of law activities in crime suppression, situation and trends in the above-mentioned fields, and suggestions on how to systematically deal with these issues. The Thematic Conference Proceedings represents a significant contribution to the existing fund of scientific and expert knowledge in the field of criminalistic, security, penal and legal theory and practice. Publication of this Conference Proceedings contributes to improving of mutual cooperation between educational, scientific and expert institutions at national, regional and international level.

Finally, we wish to extend our gratitude to all authors and participants at the Conference, as well as to reviewers of the Proceedings, Mr Vladimir Tretyakov, PhD, Mr Mykhail Cymbalyuk, PhD, Mr Wang Shiquan, PhD, Mrs Snežana Nikodinovska-Stefanovska, PhD and Mr Vid Jakulin, LL.D. We also wish to thank the Ministry of Interior of the Republic of Serbia on its support in organization and realization of the Conference, as well as the Ministry of Education, Science and Technological Development of the Republic of Serbia, for its financial support in publishing of the Thematic Conference Proceedings

We sincerely hope that the "Archibald Reiss Days 2013" will become a traditional, internationally renowned scientific conference.

Belgrade, March 2013

Programme and Organizing Committees

CONCLUSIONS AND RECOMMENDATIONS

During the third International Scientific Conference "Archibald Reiss Days 2013", there was a meaningful and fruitful discussion within the topics, current problems were analyzed, solutions de lege ferenda *were proposed, and new developments in various scientific fields were presented. The key recommendations and conclusions of the presented papers, grouped by topics, are as follows:*

1. Management in Public Administration

- The economic and financial crisis affecting the modern world renewed the dilemma about the role of government and administrative system; there is a need to establish a rational, responsible and efficient government that would allow foreign investment and ensure the proper and effective exercise of the rights and interests of citizens and other subjects. In line with the changing environment, it is necessary to change *modus operandi*, modernize procedures and processes and ensure admission of highly skilled personnel.
- Many countries have adopted public administration reform strategies and action plans for the management of the new changes; although most of the countries adopted reform strategies, special problem is the implementation of the strategic framework. The Action Plan needs to provide the liability of competent authorities for undertaking certain measures and to establish a time frame for their implementation.
- New approach to reform of the state and public administration must be in accordance with the economic and financial situation. It is necessary to strengthen the capacities in terms of development and institutional capacity building, to be able to efficiently and effectively implement the European Union policy. Bodies and organizations of state and public administration have a special role in the fight against corruption and organized crime.
- The implementation of the methods of functional analysis to identify the tasks that need to be performed and streamlining of administration are necessary.
- It is necessary to establish effective cooperation between national administrative systems, since due to the strong European convergence, the differences between administrative systems have been overcamed. By adopting common standards, Member States modify and enhance their systems under a strong influence of European coherence. Cooperation between countries through the exchange of best practices and experiences and comparison of successful methods, affects the overall improvement of functioning of administrative bodies (including judicial and other authorities).
- New solutions in the field of human resources management, providing a strong position and role of the central body for human resource management and the implementation of permanent process of professional development of civil and public servants are required. The general professional training of civil servants must be tailored for police officers, given the specific tasks they perform.
- The adoption and application of modern management principles are required, and special responsibility for their introduction and effective implementation belongs to managers in bodies. They must be professionally trained in terms of new methods of performing work and tasks.
- It is necessary to set out efficient system of protection of civil servants' rights (in proceedings before administrative bodies and competent courts).
- Provision of the rule of law and the legal security of citizens and other subjects, the adoption of necessary regulations and changes to the existing ones, as well as establishment of mechanisms for their effective implementation are necesary. Acceptance of regulations by the citizens, and their compliance with them, raising awareness about the new and accountable public administration, raising the level of professionalism and competence of the employees, which affects the quality of work of administration in whole, are reqired.

2. Current Problems of Structuring and Functioning of Police Organization

- Problems were analyzed, and solutions related to contradictions of police organization, past, present and future of police organization, which attract significant attention of professional, civil and general public, were proposed.
- Contradictions in police organization represent professional challenges for all police officers, whether they are executives or managers.
- Sinergy that the police organization should enable is a prerequisite of optimal connection of process (managing, for example control, etc.), branch (executive, for example. traffic safety, etc.), and auxiliary (analytics, link and cryptographic, computer support, etc.) functions of the police organization, and its structuring.
- If optimal organization is not followed by the proper organizational culture and generally acceptable organizational behavior of police officers, police organizations will not be able to meet the needs of the state and society.
- The problems and proposed solutions in the field of policing and professionalism of the police, standardization of policing, regular, emergency, specific and special police tasks, were analyzed.
- It was pointed to the need for optimization of policing using modern decision theory, based on the application of quantitative methods and information technology in order to support decision making, team method and work, systematic way of thinking about the police issues etc.

3. Contemporary Concepts in Criminalistics

- It is necessary to improve criminalistic practice in accordance with the possibilities of modern scientific and technological achievements.
- It is necessary to define models of information and continuous training of police officers and magistrates regarding the possibility and necessity of the application of modern scientific and technical achievements in the procedures of prevention, detection and solving criminal offences, locating and arresting perpetrators and providing evidence.
- It is necessary to define the procedures of police officers during the implementation of specific measures to prevent and combat crime (especially regarding the use of methods based on the achievements of science and technology).
- Continuous evaluation of working methods and the legal framework of criminal police conduct in the prevention, detection, clarification and proving of committed criminal offences is necessary.
- The improvement of the existing and finding new scientific methods for more efficient prevention and combat agains crime are required.
- It is necessary to review the basic elements of job profile of a criminalist, and continously work on developing police integrity and improving the level of professionalization of criminal police.
- It is very important to develop programs of specialization of police officers of criminal police in line with current trends and the basic characteristics of crime (defining the pyramid of education in line with the organizational model of the police).
- Continuous analysis/evaluation of models of police organization is necessary, in order to increase efficiency.
- The development and implementation of criminalistic strategic approach to the prevention and combating crime is required.
- It is crucial to improve systematic approach to preventing and combating crime, organization and coordination of various state bodies in preventing and combating crime.

4. Crime and Penal and Legal Reaction

- Organized crime, crime of violence, human trafficking, corruption, cyber crime, are modern, often very serious forms of crime, whose expansion is characteristic not only for our country and the countries in the region. Fighting these forms of crime requires engagement of many subjects in various fields, ranging from establishing criminal policy, creating legislative and institutional framework for the criminal justice action, especially preventive mechanisms in this area, through the application of modern methods of detection and prevention of these types of crime to further development and expansion of institutions of international police cooperation.
- The Law on Amendments to the Criminal Code of Serbia of December 2012 harmonized the substantive criminal legislation with European standards, particularly when it comes to crimes related to corruption, terrorism, as well as some issues of general criminal law, in particular those related to sentencing. However, a lot of issues remain unsolved by these amendements, which require a certain audit, so it seems necessary to continue the already initiated reform of criminal legislation.
- Some forms of modern crime (economic crime, organized crime, corruption, money laundering, etc.) and their expansion imposed the necessity of introducing criminal liability of legal persons in our legal system, which was done by passing the Law on the Liability of Legal Entities for Criminal Offenses . However, although it has been a while since it was passed, the results of its practical application can be assessed as unsatisfactory.
- Although the Criminal Code of Serbia of 2005 and its subsequent amendments significantly altered the system of criminal sanctions, the use of the so-called alternative sanctions in our country has not produced satisfactory results. Reasons should be sought in the inadequate system of institutions responsible for monitoring and enforcement of these sanctions, the conservatism of judges, and the negative attitude of public opinion towards their implementation.
- Despite great efforts in finding new, alternative sanctions, imprisonment sentence remains the most important and the most serious sentence in majority of modern countries. Its full effects can be achieved with its appropriately weighted prescribing and imposing, as well as its carefully implemented execution, since only in that way it can, in addition to repressive, have a preventive character.
- Protection of children from various forms of abuse and harassment gains a growing importance at the international and national level. Our country is also making significant efforts in that direction, by improving the legislative solutions in this area and strengthening institutions dealing with the protection of children and their rights. One of these certainly is the institution of the school police officer.

5. Forensic Methods in Criminalistic Identification

- Within the analysis of the current state of forensic laboratories in connection with the acceptance of material evidence by the court, it was pointed to the importance of certification of forensic laboratories and the overview of the current situation in the region.
- In the field of forensic accounting, the need for economic and financial expertise in the process of proving criminal cases of economic crime has been emphasized, given the fact that the current legal solutions fail to solve many dilemmas.
- Within the forensic chemistry, it was pointed to the importance of using chromatographic methods of analysis in forensic identifications. A brief overview of the thin-layer, liquid and gas chromatography, which can be used to identify explosives, drugs and other substances, was presented.
- Within forensic genetics, the results of research were presented, which, with the application of genetic statistical analysis, showed a high degree of homogeneity of the studied sequences and scientifically based justification for the formation of a STR reference database for the entire territory of Belarus.

- Within dactyloscopy, the possibility of using directional filtering techniques (Log-Gabor) to improve the quality of the fingerprint images, as a result of extensive researches by the authors, was presented.
- Since in recent years the use of biometric facial identification has increased, the results of the research of strengths and weaknesses of these forensic methods in terms of reliability were presented at the Conference. In fact, it was concluded that the technology used for biometric identification is accurate when it comes to verification, but not always when it comes to identification. The problem arises when a person has a different make-up, glasses, or a different hairstyle when it comes to spotting the differences and in cases of identification of twins.
- In the field of forensic examination of documents, the paper that has pointed out the advantages and disadvantages of the old and new ways of protection of euro banknotes from forgering, was presented.
- Multidisciplinary papers, for example, in the field of forensic medicine and forensic entomology, which stressed the importance of cooperation between different subjects to determine the time of death based on the life stages of insects found on the body of the victim, were also presented at the Conference. The paper presented the results of the research, which proved the claim that in determining the time of death of a victim of a crime (e.g., murder), methods of forensic entomology are more reliable 72 hours after death.
- Also, among multidisciplinary papers, the paper that highlights the importance of cooperation between forensic engineer and jurist that studies the connection between the explosion effects on the environment and different possibilities for qualification of crimes committed with them, given that different masses of used brisant explosives indicate different intentions of the perpetrator, was presented. This paper presents a statistical analysis of cases of explosive devices activations on the territory of the City of Belgrade Police Administration. The results of the research show the relevance of the type and mass of used explosive for the occurrence of the consequences in the form of property damage, injury and death of people, and the importance of other factors such as location, time, manner of placing and activating an explosive device.
- It was also pointed to the possibility of application of thermal imaging techniques in forensics – in biometric identification, forensic processing of fire sites and explosions.
- By presenting a number of new and current forensic methods related to the identification of persons and unknown substances, the conclusion of the necessity of innovation, development and great potentials of application of forensic methods, especially in criminalistics, imosed itself. During the Conference, it could be concluded that the interests of all authors were focused on modern methods of identification. Depending on financial resources, some authors have presented results unattainable for the other participants in the Conference. Precisely this ability, to perceive and understand these researches, with discussion and clarification of the authors, directly provides the possibility of expanding scientific knowledge. The purpose of this kind of scientific conference, in terms of meeting people and future professional and personal inter-institutional cooperation, has been fully satisfied.

6. Contemporary Security Studies and Security of the Republic of Serbia

- *Contemporary security studies* have become extremely current area of research in the social sciences in our country, the region and the world.
- The authors of papers made a special contribution to areas such as: critical review of the development of security studies in the world; expanding the security study field and development of theoretical concepts of safety - from individual, societal and national, to regional and international security; sectoral approach to the study of current security issues, with an emphasis on environmental, economic and energy security; safety in emergency situations, security and crisis management.
- All papers reflect meticulous research methodology according to required rules, which were implemented on the basis of a comprehensive analysis of the rich research and scientifically relevant material; hence the results presented in papers are clear, critical, and provide a good basis for further scientific development of contemporary security studies.

- The quantity of scientific work in the field of security indicates the necessity of a formal institutionalization of scientific field of security studies, by normative introduction in the national nomenclature of sciences. Within the security scientific field, more specific scientific fields, particularly the field of national security, international security, security in emergencies would be developed, which would lead to a change in the national nomenclature of educational profiles. Many new jobs in the area of security, which require amendment to the national nomenclature of job profiles, emphasize this fact.
- In addition, the practice of organizing scientific conferences that are fully or prtially devoted to solving contemporary problems of security, such as "Archibald Reiss Days", should be continued. This is an excellent opportunity to promote the results of numerous research projects of multidisciplinary, and, as a rule, of security nature, such as those implemented by the Academy of Criminalistic and Police Studies.

CONTENTS

TOPIC V
FORENSIC METHODS IN CRIMINALISTIC IDENTIFICATIONS

TOPIC V

FORENSIC METHODS IN CRIMINALISTIC IDENTIFICATIONS

UDC: 343.982.5:778.344

INFRARED THERMAL IMAGING IN FORENSICS

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Abstract: Thermal imaging represents a method for recording the temperature of objects, including human bodies, as well as their surrounding environment. Cameras for thermal imaging resemble closed-circuit television (CCTV) cameras by appearance, although they are capable of performing in a portion of infrared (IR) spectrum which is invisible to the human eye. Thus, these cameras were developed in order to satisfy the increasing need for a more efficient surveillance at night, during reduced daylight visibility, as well as during unfavourable weather conditions. In this paper we present an array of thermal imaging systems and discuss the significance and advantages of their applications, particularly in forensics. Specifically, we discuss the use of thermal imaging in biometrics, localization and surveillance of moving and static objects, protection of governmental institutions and private properties, transportation, medicine, as well as in the authentication of artwork. Thermal imaging solutions used by law enforcement and military enable detection and surveillance of suspects, even in complete darkness. Thus, suspects cannot successfully hide in the bushes or in the shadow, as their "thermal signature" is easily recorded via thermal imaging.

Keywords: Infrared thermal imaging, thermovision, passive and active thermal imaging systems, thermograms, forensics.

INTRODUCTION TO THERMOVISION AND THERMAL IMAGING EQUIPMENT

Infrared radiation, invisible to the human eye and ranging from 780nm to 1mm in the electromagnetic spectrum, is emitted by all matter, including ice, depending on their temperature. Thermal infrared radiation (wavelengths from 0,1 to 100 μm) is emitted by all matter with temperature above absolute zero (-273^{0}C) and it is dependant on object's temperature and emissivity only[1]. Since thermal radiation is a function of object's structure and temperature, thermal image of the object is characterized by its temperature[2].

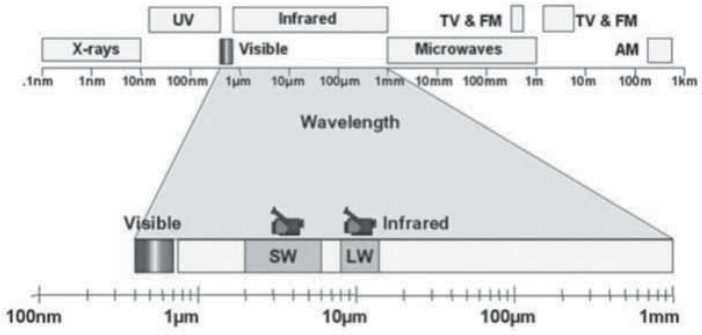

Figure 1. Electromagnetic spectrum

1 Kalušić, P. (1991): Mehanika i toplina, Školska knjiga, Zagreb.
2 Landua, L. D. i Lifšić, E. M. (1965): Mehanika neprekidnih sredina, Građevinska knjiga, Beograd (prevod Dragoljub Popović).

Similarly to conventional digital cameras, infrared or thermal cameras utilize this radiation and produce thermal images or thermograms. Thus, according to the black body radiation law, the environment can be observed even without visible light, in the process known as *thermovision*. Recording of this type of emitted light is performed via thermal imaging equipment[3], which enables efficient surveillance at night, during reduced daylight visibility, as well as during unfavorable weather conditions. Thermal imaging equipment comprises of a thermal imaging camera and a computer (Figure 2). The camera uses infrared optics, infrared sensor, a thermal energy to video signal converter, a monitor and a card where temperature data is stored. The computer reads the data stored on the camera card and processes the acquired thermal image (thermogram).

Figure 2. Thermal imaging equipment

Infrared cameras do not detect temperature, but, rather, thermal radiation. As the amount of thermal radiation increases with temperature, thermovision allows visualization of temperature changes. In both daylight and nighttime conditions, "warm" objects recorded by thermal imaging stand out compared to their "cooler" environment. Cameras for thermal imaging resemble closed-circuit television (CCTV) cameras by appearance, although they are capable of performing in a portion of infrared (IR) spectrum which is invisible to the human eye, generating a thermal image known as thermogram.

Special optics used in infrared cameras collects the electromagnetic energy and directs it onto the detector. The camera sensor, then, measures the amount of energy on its surface. In order to accurately obtain the temperature print of the recorded object, it is necessary to consider surface characteristics of objects, temperature of surrounding objects, camera distance, environmental temperature and relative humidity of air. Thus, a quality camera software must account for these predetermined input parameters. Also, contribution of all "non-camera", infrared light sources needs to be reduced as much as possible.

Infrared imaging technology is based on optoelectronic infrared radiation detectors, which perform at distinct wavelengths:

– (0.76 -1) μm – very near infrared radiation
– (1-3) μm – near infrared radiation
– (3-8) μm – mid-wavelength infrared radiation
– (8-14) μm – long-wavelength infrared radiation
– (14-40) μm – far infrared radiation

Thermal imaging is a non-contact technique in which recording of temperature and development of a thermogram can be performed in a fraction of a second. This implies that thermal image stores more information compared to an image obtained via a visible light source, based on a reflection of radiation around the objects.

Since characteristics of electromagnetic radiation are the same in the entire spectrum, the optics used in thermal imaging equipment is the same by appearance to the one used in conventional cameras, which operate in the range of visible light. However, the optics material is quite different in the two camera systems, given that the glass used in conventional cameras efficiently blocks in-

3 Pešut, H., Krklec, T. (2000): Infracrvena termografija, Energonova, Zagreb.

frared light. Therefore, lenses in thermal imaging cameras must be made of materials which allow infrared radiation to pass. For long-wavelength infrared radiation, lenses are typically constructed from germanium, zinc sulphide and zinc selenide, while for mid-wavelength infrared radiation they are made from silicone, sapphire, quartz and magnesium. Detection and surveillance of objects in the long-wavelength infrared radiation range is based on the measurements of temperature and emittance between objects and their surrounding environment. Critical component in these measurements are quantum detectors. As quantum represents a discrete quantity of energy at a particular wavelength, quantum detectors are devices which receive quantum's amount of heat. The most exploited material for the construction of quantum detectors is cadmium mercury telluride (CMT), which changes electrical resistance when it receives a quantum of heat. Quantum detectors commonly used include photodiode, photoconductor and photoelement, while other types of detectors, thermal detectors, in use are thermoelement, pyroelectric and bolometer (thermocouple).

A thermogram depicts objects and their environment, where a contrast of an image is a consequence of radiation and emissivity of matter, given different object and environmental temperatures. The process of creating a thermal image, itself, differs from the process of image creation in the visible spectrum.

Considering technological aspects, the process of creating a thermal image underwent different phases. In the very beginning, infrared image of an object was created using an infrared detector with a cooling system. The reflection of an object on the image, used to be formed by a movement of a scanning mirror on the horizontal and vertical planes, on which the infrared radiation falls, examining one by one image element. Reflecting off of the mirror, infrared radiation would pass through the optics and fall onto a discrete detector. It was necessary to cool down the detector at a temperature of approximately 80 K. With the introduction of line detectors, the scanning by line scanners begun, where the terrain was scanned by a line comprised of n detector line elements.

According to the principle under which they operate, all thermal imaging systems today can be grouped into the following two categories:

- Thermal imaging systems with infrared line scanning (IRLS)
- Thermal imaging systems with detectors in a focal plane array (FPA).

According to the approach to measurements and data processing, thermography can be:

- *Active*, that is, sensitive to an infrared radiation from an artificial source, reflected by an object from a specific environment
- *Passive*, that is, registering radiation of objects with regards to the reflected sunlight.

Active thermography represents a dynamic recording of object's surfaces exposed to the heat action. The reaction to the heat action is observed, that is, surface temperature distribution over time. Further analysis allows for the determination of material structure below the object's surface. In order to perform active thermography, energy source producing a thermal contrast between an object and its surroundings is needed. This approach is often utilized when objects are in equilibrium with their surroundings.

Passive thermography represents passive recording of objects. The differences in amounts of infrared radiation coming from object's surfaces are either a consequence of temperature differences or a consequence of differences in observed surface differences. In passive thermography, objects of interest typically possess a higher or lower temperature compared to the background.

Environmental infrared radiation, used to produce thermograms, depends on objects' temperature, environmental temperature, object types, physical properties of objects and their surroundings, as well as the radiation from the Sun. Infrared line sensors usually perform in either low (3-5 μm) and high range (8-14 μm).

First experiments on sensors which measure environment's and object' own infrared radiation were performed in 1900. The first military use of infrared sensors date to World War I, when planes were detected at a distance of 1.5 km and humans at a distance of 0.3 km. The first commercial infrared camera, which appeared in 1965, was used to examine power transmission lines. It was not until 1973 that portable infrared cameras became available. In civil society, infrared cameras are today readily used to protect large houses and private properties. It is expected that in the future home security systems based on small thermal cameras will be widespread.

Passive and active thermography are techniques for acquiring thermal image of an infrared light emitted by objects in their thermal condition. This image is invisible to the human eye. Thermogram can be recorded by a film sensitive to infrared radiation in the 250°C to 500°C temperature range. Thus, in order for an object to be shown on an infrared film, it must be at a temperature above 250^0C or reflect infrared radiation from an object with at least the same amount of heat. Thermography equipment operates in a -50°C to over 2.000°C temperature range. Devices used for night surveillance, which can be used in complete darkness, show image of near-infrared radiation. There also exist devices which enhance ambient illumination.

It is important to note that there is a difference between thermal imaging and "night vision". Night vision cameras enhance minute quantities of visible light thousands of times, thus enabling visualization of objects at night. Clearly, this is possible only if even minute quantities of visible light are present, such as moonlight or starlight. This condition, on the other hand, is not necessary during thermovision. Another advantage of thermovision, compared to the night vision, is that night vision cameras become blinded by a direct light source. As thermographers are concerned with energy source only, they are not influenced by light sources.

Thermograms represent a colourful world, otherwise invisible to the human eye. Their first purpose is to realistically represent the heat emission state, and it is necessary to process them in order to make any conclusions. Each thermogram is independent, as it is related to its own colour scheme. Therefore, no two thermograms can be directly compared based on colours, even when they represent images of the same objects. In other words, each thermogram comes with its own colour scheme, which demonstrates the relationship between colours and temperatures (Figure 3).

Figure 3 – Thermogram of a handprint with corresponding colour scheme

In order to accurately assess the temperature, thermal imaging camera also creates a temperature diagram, which exhibits the object temperature range along the line drawn on the thermogram. The more uniform the colours, the more uniform heat emission, and vice versa. Establishment of an approximate measure of heat emission can be achieved when the difference between external and internal wall and air temperatures are considered (external and internal image). Lighter and warmer colours (such as yellow and red) indicate warmer places, while darker and cooler colours (such as blue and violet) indicate cooler places.

INFRARED THERMAL IMAGERY IN FORENSICS

Emission of infrared radiation is broadly used for analyses of different phenomena in a broad array of human activities, such as electronics, mechanical and civil engineering, architecture, medicine, forensics, etc. Therefore, there exists a need for a widespread application of thermal imaging in commercial sector, law enforcement, military, insurance houses, and so on.

Infrared thermal imaging provides police and security agencies with a powerful evidence material for detection and proving of criminal actions. This primarily refers to the following activities:

- Identification of perpetrators of crime and offenders on the run
- Border crossing control
- Secure access control to:

  - digital resources, such as computers, websites, software, networks and servers
  - public and private facilities and properties
  - production plants
  - jails
  - banks
  - galleries and museums
  - transportation hubs for passenger and goods transport
  - residential buildings
- Forest protection of fire
- Employee security
- Search and rescue
- Car chase
- Illicit drug trafficking prevention
- Airdrop aiming
- Marine transport monitoring.

The advantages of using thermal imaging over other methods for obtaining surface image of objects are multiple. The image obtained allows for temperature analysis on a large surface. The technology enables real-time capturing of moving targets and can be employed for recording in dangerous, difficult access and dark locations. The method is particularly valuable for no-contact-discovery of defects in metal parts of technical systems, without placing the production process on hold. Infrared imaging can be useful when the change in thermal image indicates an anomaly, thus discovering errors, integrity and appropriateness for use assessment. For instance, thermal imaging is applied for diagnostic process of electromagnetic (facilities, networks, adapters, electrical installations) and mechanical equipment (boilers, pressure vessels, heating pipelines), as well as building construction (insulation, waterproofing).

Application of thermal imaging in forensics is also broad, including identification of people via thermograms of certain body parts (for instance, face, ear, hand), surveillance and detection of objects, determination of fire and explosion causes, traffic violations, authentication of artwork, etc. It should be noted that thermal imaging in forensics can be used for crime prevention, real-time identification of people and objects, as well as identification of cause and effect relationships.

THERMOGRAMS OF BIOMETRIC CHARACTERISTICS FOR HUMAN IDENTIFICATION

Infrared thermal imaging is used for identity determination of people via stable biological characteristics of human bodies[4]. Such characteristics represent biometric identification traits, which allow for automatic identification process. The process is performed in an automatic information system, in which thermal image is transferred into a digital form and further processed to be compared with templates stored in a system database. As a result of such comparison the final decision is reached, that is identification is made. Biometric systems typically perform human identification based on face, hand, ear and whole body thermograms (Figure 4).

Advantages that human bodies offer enable formation of thermograms based on one of its stable characteristics. Namely, blood vessel patterns found in the entire human body, particularly in the subcutaneous layer, represent unique trait of individuals. Infrared thermal imaging, detection of temperature differences at skin surface) allows registering of radiation which blood vessels emit through the skin. Identification of individuals via such unique thermograms can be performed at an angle or in complete darkness. In addition, this technology enables identification of unaware and uncooperative subjects, so the recording can be performed even from a further distance.

4 Barnes, R.B. (1963): *Thermography of the human body*. Science, 140: 870-875.

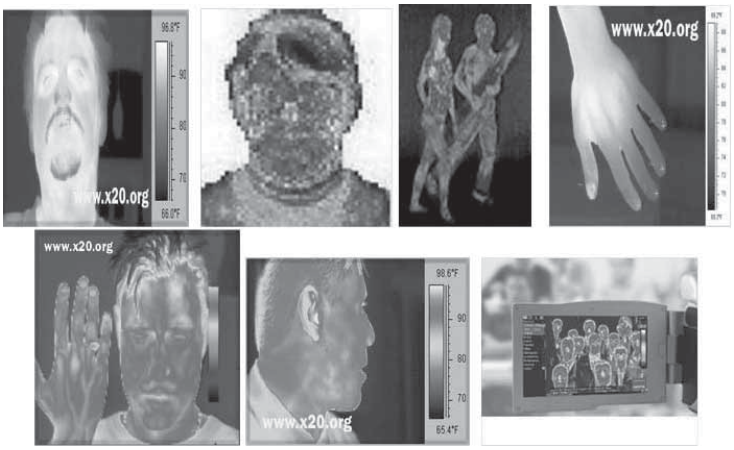

Figure 4. Thermograms: biometric identification images

INFRARED THERMAL DETECTION AND SURVEILLANCE OF OBJECTS AND ENVIRONMENT

Specific thermal imaging equipment has been developed for detection and surveillance of objects[5] in order to satisfy the increasing need for a more efficient surveillance at night and during reduced daylight visibility (Figures 5 and 6). Depending on their use, infrared thermal imaging equipment can be fixed on a stand, connected to another device, integrated into a weapon or in a form of a portable device[6].

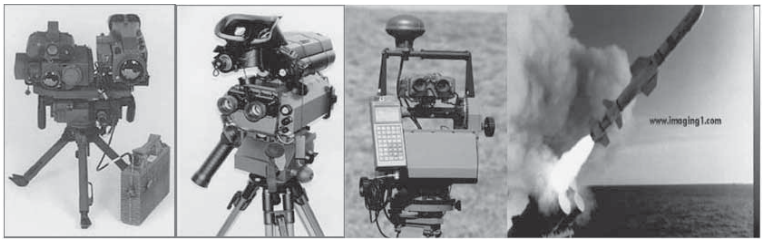

Figure 5. Thermal imaging equipment

Figure 6. Thermal imaging systems

5 Park, J. and Mackay, S. (2003.): *Practical Data Acquisition for Instrumentation and Process Control*, Newnes, Oxford.
6 Mobley, R.K. (2002): *An Introduction to Predictive Maintenance*, Second Edition, New York: Butterworth–Heinemann.

Distance surveillance range of these systems varies from 200 to 20.000 m, with an error of 5 m, while their temperature range is -32^{0}C to + 45^{0}C. They are resistant to vibrations, impact, humidity, rain, sand, fog, etc.

Infrared thermal imaging devices can visualize small, irregularly shaped, far away objects. This feature enabled their use in electronic industry, during the production process, as well as in diagnostics and rapid identification of electrical problems. Infrared thermal imaging systems are quite helpful for physical access control of material goods and minimize the risks at both daylight and nighttime. Thermal imaging is utilized for active daytime or nighttime surveillance of woods, nuclear power plants, airports, bridges, petrochemical plants, pipelines cargo terminals, commercial complexes and private properties. This type of control also prevents unauthorized access to water resources, shores, ports, etc.

Infrared thermal imaging is quite a reliable method for securing government and private properties. Unlike traditional approaches, it does not require image enlargement or additional illumination of objects. Even under unfavorable weather conditions, thermography allows thermographer to perform covert surveillance. This is the most contemporary recording method for methodical and flexible implementation of multi-purpose projects.

INFRARED DETECTION OF FIRE AND EXPLOSION CAUSES

Infrared thermal imaging represents an important and powerful tool. Such monitoring and recording of electric wires, machines that operate for a long time, their structure imperfections and other hidden potential causes of fire (Figure 7) can prevent fatal consequences. Infrared thermal cameras also allow detection of victims in thick smoke and dark, as well as fire epicentre, since they "see" flow of hot gasses, thus enabling fire-fighters to directly reach the target. After putting out the fire, thermography in the fire aftermath, can point out to hidden and invisible ember.

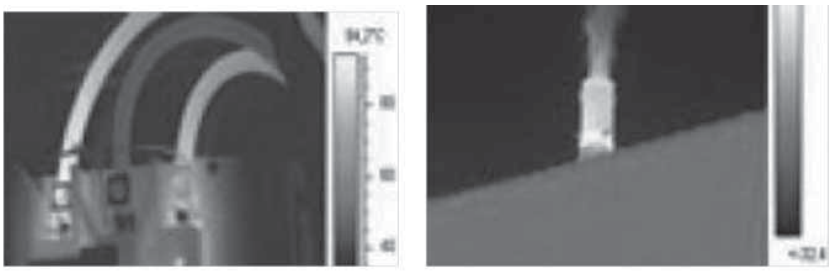

Figure 7. Thermograms of electrical installations and a chimney

INFRARED THERMAL IMAGING IN TRANSPORTATION

Thermal imaging systems, positioned outside or inside, greatly enhance transportation efficacy and safety, irrespective of weather and illumination conditions. Infrared camera clearly distinguishes motor vehicles, signs, cyclists and pedestrians and can provide accurate information about the number of traffic participants in a timely manner. Airports, train stations and bus stops can be monitored to gather information regarding the number of passers-by, traffic congestion, passenger flow at departure and arrival terminals, as well as service-providing facilities. Multiple cameras can be connected into a network, covering a large area. Monitoring of tunnels, railways, roads and cycling tracks is also possible.

Visibility is the key determining factor in traffic safety. Despite enormous improvements in vehicle lights in the past decade, such as enhanced halogen headlights, introduction of xenon headlights, as well as devices for directing light beam towards to road curve, driving at night still carries significant risks. In addition to extensive lighting of policemen, road surface markings with reflective materials, updating of traffic signs, there still a need for infrared cameras in the automotive industry. Infrared lights are more potent when moving through the air, compared to visible light, especially during poor weather conditions (rain, snow, ice storm, fog, smoke). Infrared radiation

passes through materials which are an impermeable barrier for visible light (cardboard, black paper). Today, thermal imaging cameras are in use in the automotive industry, as they are built into car bumpers. Camera registers thermal radiation of people and objects in the region of 8 to 14 km.

Unlike cameras operating in visible light spectrum and conventional infrared cameras which generate image by enhancing available ambient light, thermal imaging cameras generate images by measuring temperature differences of objects (Figure 8). Every object emits a certain amount of thermal radiation which is "seen" via thermal imaging, that is, thermal imaging cameras generate images regardless of the extent of light present. This feature makes them such systems ideal for navigation purposes, as well as traffic monitoring and transportation safety.

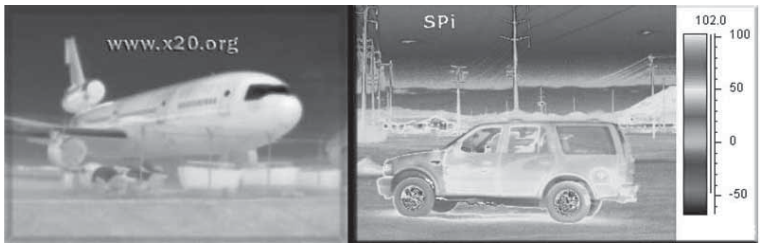

Figure 8 – Thermograms

A good example is Mobotix M12-LPR technology, which contains special lenses, one of which is particularly sensitive to the light reflected off of car plates. In such a way, license plate number is easily captured during both day and night (Figure 9). This image possesses optimal resolution, so that software for automatic plate detection can easily read information off the plate. Since M12-LPR contains two lenses, the other lens captures an entire image of the vehicle.

Figure 9. Image of license plate taken at night, at a 50m distance

Lately, two types of infrared technologies have been used in traffic monitoring: active and passive. Active infrared devices use their own infrared light source and headlights, constructed in a different way compared to traditional ones. Light reflected by objects, the road, humans and animals, are captured by an infrared camera, converted into an image in a processor and displayed on the screen in front of the driver. In a passive device, thermal imaging camera directly records the heat emitted by objects, people and animals, so additional source of infrared light is not needed. As previously, captured information are also transformed into a visible image and displayed on driver's screen. Passive systems have a 200% further reach compared to other techniques, while active technology covers the same range as high beam headlights. BMW car manufacturing company possesses a long range system (up to 300 meters), which enables drivers to recognize an object on the road 5 seconds earlier than with high beam headlights, at a 100 km/h speed. Thus, the driver is warned of potential danger 5 seconds earlier.

Radiation emitted by pedestrians, cyclists, animals and vehicles on the move is higher than their surroundings, static objects, parked cars and traffic signs, thus they are „thermally visible". Virtual image of the road resembles a photographic negative, as "warm" objects, such as people and moving vehicles, are white, while the background is black. Weather conditions influence the image quality. Thermal imaging camera is installed in a special casing, on the left side of the front bumper. It has a 320 x 240 pixels resolution and a range of approximately 300 meters; its infrared sensor registers thermal radiation of people and objects. At 80 km/h speed, it captures at an angle of 36 degrees, in a horizontal plane, which allows monitoring of not only the road itself, but also the side of the road.

Active system in a new Mercedes-Benz S class comprises of a few components which can be activated at night, when the low beam headlight is already turned on. Two infrared headlights, which illuminate the road with invisible infrared light, automatically switch on at speeds of at least 15 km/h and remain activated during braking, until the vehicle decelerates to 10 km/h. The system is not active when the vehicle is in reverse. Infrared camera at the inside of the windshield records the space in front of the vehicle, converts the information into an image and displays it on the driver's screen. As soon as the system becomes active, the driver's screen, otherwise a speedometer, begins displaying the images captured by the camera. Vehicle speed is then displayed horizontally at the bottom of the screen.

Mercedes performed a comparison between Bi-Xenon low beam headlight and a new Night-view Assist device. Drivers operating vehicles with the latter spotted a test doll dressed in light clothing 210 meters away, that is 41 meters before drivers in vehicles with Bi-Xenon lights. The results were even more dramatic when the test doll was dressed in dark clothing, 164 m vs. 72 m, a 125% improvement. Future developments will focus on Night Vision systems capable of identifying potential dangers on the road and warn the driver. The main advantage of the system is that it does not blind the drivers operating oncoming vehicles.

The use of infrared thermal imaging in automotive industry also includes examination of suspension and tire contact on race cars, braking system and engine, cooling systems, etc. In aerospace industry, infrared thermal imaging is applied in diagnostics, such as water penetration at plane's surface, tires and braking system, anti-icing system, voltage and corrosion, jet and rocket engine, composite materials, etc.

INFRARED RECORDING IN MEDICINE AND VETERINARY SCIENCE

Some applications of infrared thermal imaging in medicine and veterinary science are shown in Figures 10 and 11. With its accuracy and convenience, it simplifies animal and human care[7] by facilitating diagnostics, detection and monitoring of therapy consequences, bypassing invasive procedures[8]. Examples of applications are in the examination of spinal injuries resulting from sudden head movement, Carpal Tunnel syndrome, the course of breast cancer, arthritis, vascular diseases, jawbone dysfunction, sports injuries, therapy progression, as well as in dentistry, examination of horse injuries, stress caused by injury, limping, etc.

Figure 10. Thermograms in medicine

7 Empel, W. (1998): Radiodiagnostyka weterynaryjna, PWRiL, pp: 10-13, 27-28, Warszawa.
8 Purohit, R.C., Mc Coy, M.D. (1980): *Thermography in the diagnosis of Inflammatory Processes in the Horse*. American Journal of Veterinary Researches, 8:1167-1174.

Figure 11. Thermograms in veterinary science

INFRARED THERMAL IMAGING IN THE ARTS

Infrared thermography, a non-contact method for measuring the intensity of infrared radiation at an observed surface, produces thermograms, colour images of temperature distribution on the surface of objects. Temperature distribution provides information of the object surface, or of the object surface and inner layers of the observed objects. This feature also allowed the use of infrared imaging in the area of artwork authentication, such as authentication of controversial pieces of art and cultural heritage protection. Clearly, thermograms represent the most reliable evidence in court, as fast and accurate means of solving these types of crimes.

Analysis of paintings and their imperfections is performed with infrared radiation with wavelengths ranging from 1 to 2.5 mm. These waves easily pass through the painted layer and reflect off it. Visible light is projected onto the painting, while the infrared sensitive camera records the image is converted to a form visible to the human eye.

The most convenient recording method for analysis of layers underneath the painted material of paintings is infrared reflectography, a non-destructive optic technique. It is based on the fact that infrared radiation passes through the painted layer and reflects off canvas board. Obtained image is a result of the contrast between radiation reflected off canvas board and absorbed by material composing the painted layer. The foundation of the technique is the fact that each element is sensitive to electromagnetic radiation of specific wavelength, while all other materials behave differently at the same wavelength.

First infrared reflectograms were made with a film sensitive to infrared radiation, which resulted in low quality images with not a lot of information. Today, charge coupled device (CCD) cameras are used to detect the reflected radiation, filter it and convert to a visible image. A software connects an array of reflectograms into a single recording. Camera is coupled to a monitor, which instantaneously displays the recording results, which allows on the spot parameter fine tuning. Therefore, this method reveals the painting itself, underlying drawing, painter's signature, earlier restoration efforts, as well as all the changes that the painting underwent. The revealed information tells a story of the way the painting was made, discovers the preservation level, and sometimes greatly helps in the authentication process.

CONCLUSIONS

Since their beginnings, thermal imaging systems have undergone enormous technological development, including incorporation of superb optoelectronics into the camera and digital image processing equipment. They are broadly applied in forensic science, given that they are capable of capturing a wide variety of objects. Biometric identifications based on comparisons of face, hand, ear, etc. thermograms are exceptionally accurate. Numerous examples point out that thermal imaging methods are crucial in detection, surveillance and security.

As all technologies, thermal imaging systems have their advantages and disadvantages. Advantages include contact-free scanning, rapid response, relatively simple interpretation of thermograms and wide application. Disadvantages include impact of the emission spectrum, atmosphere, distance, geometry of an object and other factors on measurements, low conductivity thermal stimulation of large objects and the ability to observe the surfaces of objects only. Further developments will surely enhance the possibilities and scope of thermal imaging use.

Clearly, it is significant to note that qualitative and quantitative analyses of themrograms require personnel trained in thermal imaging systems, as well as in the specific application. In order to achieve high accuracy, thermal imaging recording should be performed by knowledgeable personnel, using a new generation thermal imaging camera, which due to its portable SD card, memorizes static and dynamic images and generates all the necessary reports. Today, infrared thermal imaging systems completely dominate, as identification technique, in certain areas of life[9] [10].

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REFERENCES

1. Barnes, R.B. (1963): *Thermography of the human body*. Science, 140: 870-875.
2. Empel, W. (1998): Radiodiagnostyka weterynaryjna, PWRiL, pp: 10-13, 27-28, Warszawa.
3. Kalušić, P. (1991): Mehanika i toplina, Školska knjiga Zagreb.
4. Landua, L. D. i Lifšić, E. M. (1965): Mehanika neprekidnih sredina, Građevinska knjiga Beograd (prevod Dragoljub Popović).
5. Mobley, R.K. (2002): *An Introduction to Predictive Maintenance*, Second Edition, New York: Butterworth–Heinemann.
6. Park, J. and Mackay, S. (2003.): *Practical Data Acquisition for Instrumentation and Process Control*, Newnes, Oxford.
7. Pešut, H., Krklec, T. (2000): Infracrvena termografija, Energonova, Zagreb.
8. Purohit, R.C., Mc Coy, M.D. (1980): *Thermography in the diagnosis of Inflammatory Processes in the Horse*. American Journal of Veterinary Researches, 8:1167-1174.
9. SAS (2000): *SAS User's Guide*. Version 8.0. SAS Institute Inc., Cary, NC.
10. Wu, B., Gebremedhin, K.G. (2001): *Numerical simulation of flow field around a cow using 3-D body-fitted coordinate system*. Journal of Thermal Biology, 26: 563-573.
11. http://www.infraredsolutions.com
12. http://www.flirthermograpy.com
13. http://ssc.spitzer.caltech.edu/IRAC/
14. http://compoundsemiconductor.net/articles/magazine
15. http://lfw.pennnet.com/article..._display.cfm?article

9 SAS (2000): *SAS User's Guide*. Version 8.0. SAS Institute Inc., Cary, NC.
10 Wu, B., Gebremedhin, K.G. (2001): *Numerical simulation of flow field around a cow using 3-D body-fitted coordinate system*. Journal of Thermal Biology, 26: 563-573.

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REFERENCE DATABASE OF AUTOSOMAL DNA MARKERS: POSSIBILITY OF GENOTYPE ANALYSIS OF LARGE POPULATION ARRAYS OF BELARUS

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Annotation: For the first time a large-scale genetic-statistical analysis (n = 13,216) was conducted of the allele disposition of 18 autosomal STR-loci in three arrays of biological samples collected by using different methods on the population of Belarus. The results show a high level of interpopulation homogeneity of the investigated arrays and a science-based possibility of the formation of a single STR-reference database for the whole territory of Belarus. Based on the results of the study,a referential database of occurrence was formed of allele frequencies of autosomal STR-loci in the population of Belarus for information-referential supportingof criminalistic DNA analysis in the expert institutions of Belarus.

Keywords: polymorphism, autosomal DNA markers, STR, referential database, population genetics, the Belarusians.

The development of modern molecular and biological technologies based on the polymerase chain reaction (PCR) significantly increases the possibility of highly polymorphic DNA markers studying. DNA markers (especially STR-loci) have become an important tool not only in molecular diagnostics, but also in criminalistic investigations. For STR-loci are characterized by a short length of alleles, and that is important when working with degraded material, and considerable polymorphism of DNA markers provides the ability to identify and establish the identity of biological relationship with a high level of confidence. When conducting a criminalistic investigation after the step of identifying DNA-profile of biological trace, the next necessary step is to calculate the expert conclusion reliability. This stage requires an independent and scientific research and information-referential support, because the existence of various severity degrees of racial, ethnic and even interpopulation variability is shown for almost all DNA markers. Ethno-racial variability of DNA markers determines the need for creationnational reference databases of DNA markers distribution for criminalistic DNA analysis on the basis of studying genetic structure of the country population, taking into account the ethnic and historical features ofits formation.

It should be noted that science-based principles of forming reference database of DNA markers have not been developed: in the scientific literature there are no recommendations for the creation of databases of this kind. At the present time in various countries extensive studies are conducted of the features gene pool state of the population in the interests of population genetics – to solve the questions of origin, relationship, development, and interaction of human populations. As a rule, these studies involve primarily the indigenous population of the particular nation. Because of the specific work, criminalistic laboratories often do not have information about ethnicity or birth place of the offender. Due to this,there appearsthe need to obtain information for criminalistic DNA analysis about genetic characteristics of the present population as a whole and for individual ethnic groups and their components.

In order to create a reference database of DNA markers by the Belarusian scientistssince 1999,a number of populations of Belaruswas investigated on the basis of the sample collection collected by the Institute of Arts, Ethnography and Folklore of the National Academy of Sciences (Sc.D. Mikulich AI) for the reason of autosomal DNA marker distribution as well as DNA markers of Y-chromosome and mitochondrial DNA.

Forensic scientists also investigated two arrays of present population genotypes of Belarus. The first array – "criminalistic" – represents the genotypes of individuals involved in criminal cases as accused or suspects, as well as convicts in prison. Genetic DNA profiles of autosomal loci in this category of citizens are in the database of automated identification system in genetic fingerprint of the State experts and criminalistic center of the Ministry of Internal Affairs of the Republic of Belarus (hereinafter SECC of MIA).

The tested "criminalistic" array consisted of 9626 genotypes from 109 administrative districts and 13 areas for prisoners. Genotypes were grouped into separate samples in accordance with the administrative-territorial belonging to the bodies that sent the samples. The study was conducted by experts of SECC of MIA.

The second array – "ethnic Belarusians" – formed from samples of unrelated individuals buccal epithelium, that were tested for paternity and voluntary marked in questionnaires that they and their parents' national identity was 'Belarusian' at the Center of forensic expertise and criminology of the Ministry of Justice of the Republic of Belarus (hereinafter – CFEC of MJ).

Analysis of polymorphism in 15 tetra nucleotide STR-loci was performed using a set of reagents "AmpFlSTR Identifier ™ PCR Amplification Kit" ("Applied Biosystems", USA). Identification of alleles was performed on automated DNA sequencers "ABI Prism 3130 XL Genetic Analyzer" ("Applied Biosystem", USA) and "MegaBACE 750" ("Amersham Biosciences", USA) genotyping mode with the usage of internal standards with the size of "GeneScan-500 LIZ Size Standard" and "ET550-R Size Standard", respectively. A statistical analysis of the results obtained was conducted using the software FSTAT.

For the most comprehensive population-genetic analysis of the current population of Belarus a phased study was held of the allocation of the allele frequencyoccurrence of STR-loci in three separate genotypes arrays, with a following comparative analysis of the distribution of allele frequencies among them according to the next logical row:

Phase 1: study of the allocation of allele occurrence in ethnic Belarusians and related Slavic ethnicities (Russian, Ukrainian) with accurate information about nationality, place of birth and residence, followedby the analysis of the influence of regional and ethnic factors on the method of allele frequency occurrence allocation.

Phase 2: study of genotypes array,formedduring the analysis of "family samples", with accurate information about the place of residence of donors, but with no information on their ethnic origin. Analysis of the regional factor influenceon the allocation of the allele frequency occurrence. Comparative analysis with the studyresults of the first array is forassessmentof ethnicity influence.

Phase 3: study of "criminalistic" genotype array, for which we know the sampling location (place of a criminal or a suspect detention). Analysis of influence on the allele frequency occurrence allocation. Comparative analysis with the study results of the first and second arrays is forassessmentof ethnic and / or regional affiliation factor influence.

As the result of the analysis of the allele frequencyoccurrence allocation of STR-loci in the "criminalistic" and "ethnically Belarusian" groups using G-statistics method in comparison with the data obtained in the population study of Ukraine, Russia and Poland it isfound out that the ethnoterritorial groups from Belarus differ not only from afro-Americans and Latinos samples, but white Americans, too. "Criminalistic array" is also different from the Serbs, and in a sample of "ethnic Belarusians' differences fromthe Serbs are detected in all regions except Eastern marshy woodlands and the Dnieper.

With Russian from various regions of Russia and Ukrainians "criminalistic" base differs only in the locus D3S1358, the other loci showno statistically significant differences.

When compared with samples of Poles - 10 STR-loci for n = 2176, and 13 STR-loci for n = 870 - statistically significant differences are either not detected at all, or minimal (only in the locus D21S11).

The conducted study reveals significant differences between the allocation of the allele frequencyoccurrence in the population of Belarus in comparison with the allocation of the allele frequencyoccurrence in the white U.S. population, by the recommended corporations «Promega» and «Applied Biosystems» for calculation of genotyping. The frequencies of allele occurrence, offered by the manufacturer «Applied Biosystems», have significant differences in 4 out of 15 loci, and the frequency of the corporation «Promega» is significantly different in 7 of the 15 loci. The differences demonstrate the inadequacy of the allele frequencies of the white U.S. population, recommended by corporations «Promega» and «Applied Biosystems», for the calculation of confidence level of expert conclusions in expert institutions of the Republic of Belarus.

On the base of this research, scientific units of CFEC of MJ formed automated reference databases of DNA markers (hereinafter ARB DNA markers), which in 2010 were tested by experts of SECC of MIA and the State service of medical forensic examinations (SSMFE).

As a result, the database for the most used for the identification of autosomal DNA markers is fully formed in an automated form with the possibility of calculating the level of confidence in the expert conclusion (www.dnkexpertiza.org).

Currently, the ARB DNA markers on haplotypes Y – chromosome is modified to reflect the results of testing, it was conducted it's filling with haplotypes (almost 1500 haplotypes); the database is available online at the above address. Mitochondrial DNA database is upgraded and filled with mitotypes (to 1000) by the research divisions of CFEC of MJ.

Thus, today the database for conducting a forensic identification of biological traces of man for three types of DNA markers in the whole set up and allow you to perform calculations in the identification and establishment of a biological relationship. Addition of ARB DNA markers are carried out on a planned basis in the study of samples submitted for examination and identification expertise to establish a biological relationship in SECC of MIA and CFEC of MJ.

LIST OF USED SOURCES

Veremeichik, V. Polymorphism of autosomal DNA markers of the human genome in three populations of Belarus / VM Veremeichik, IS Tsybovsky, A. Mikulic // Actual problems of modern anthropology: Materials of International Scientific-Practical conference. "Genetic and morphological markers in anthropology, criminalistics and medicine", Minsk, 15-17 June. 2005 / National Academy of Sciences. - Minsk: Law and Economics, 2006. - S. 105-110.

Assessment of the principle possibility of using large arrays of genotypes of the population to create reference databases autosomal DNA markers in the Republic of Belarus / IS Tsybovsky, V. Veremeichik, S. Kritskaya, S. Evmenenko, S. Lobatsevich, A. Pavlyuchenko, N. Kartel, LA Zhivotovsky // Molecular and Applied Genetics Nye: / Inst. Genetics and Cytology; Editorial Board. A. Kilchevsky [And others]. - Minsk: "Law and Economics", 2009. - S. 103-113.

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FORENSIC METHODS IN CRIMINALISTICS IDENTIFICATIONS

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Abstract: The paper presents the directions of the development of forensic biomechanics. The author carried out the analysis of 100 expert opinions performed since 1994 in the professional field "Criminalist, subject field forensic biomechanics" in cases that were concluded by court authority. According to the analysis of the needs of practice and expert investigations, the author gives a real prediction of further directions of the research in forensic biomechanics. Forensic biomechanics invokes in investigation process, particularly violent criminal acts; an expert investigation may come to a conclusion on mechanisms of a criminal act, action of extrinsic force and expression to the consequences of this extrinsic force. The directions of the development of forensic biomechanics are given by author in following applications - biomechanics of the fall from the height, judgement of extreme dynamic burden of organism, biomechanical analysis of the fall from a stand on the ground or the fall from stairs, biomechanical analysis of a walk and analysis of conflict combat. These directions represent 90% of all processed expert opinions.

Keywords: forensic science, criminalistics, forensic biomechanics

INTRODUCTION

Forensic sciences are very closely connected with criminalistics as a scientific discipline and come in useful particularly as expert fields, e.g. judicial medicine, judicial psychiatry, judicial psychology, judicial sexology, forensic biomechanics, judicial engineering and forensic dentistry.

In last ten years forensic biomechanics has been very intensively used in investigations. From the historical point of view, forensic biomechanics is relatively very young field in the forensic science system. Biomechanics was firstly very marginally used for the solution of problems in criminalistics in the 60s and in 70s of the last century[1] when the researches of biomechanical applications were conducted. In the second half of the 90s the forensic biomechanics systematically started to develop at the criminalistics department of the Police Academy of the Czech Republic in Prague.

As other forensic fields, forensic biomechanics also separates from the original field of biomechanics. During its development it has found solutions from the expert practice and has made its own scientific and research base and the directions of its development. There are specified real possibilities for the use of forensic biomechanics in expert activity. Forensic biomechanics profiled as a self-reliant field, so that in last years the opinions from the field "Criminalistics – specialisation forensic biomechanics" have been asked more often than in the past.

PRESENT APPLICATIONS OF FORENSIC BIOMECHANICS IN CRIMINALISTICS

Generally, forensic disciplines emerged from broader scientific disciplines because certain standard questions often required judicial expert opinions. Step by step, its own research activity that has been using not only the knowledge base of the origin discipline but also generalised experiences for expert activity started to develop in their frame[2]. The origin of forensic biomechanics can be found in two sources. On the one hand, there were findings peculiar to biomechanics as the origin discipline and simultaneously generalisation of findings from expert and criminalistics practice.

1 During the development, the denotation „biomechanical content of criminalistics tracks" was first used, later the term „Criminalistics biomechanics" was introduced.
2 MUSIL, J., KONRÁD, Z., SUCHÁNEK, J. *Kriminalistika.* 2. přeprac. A dopl. vyd., Praha: C. H. Beck, 2004, s. 11.

Forensic biomechanics is a scientific field that applies biomechanics and biomechanical methods in the investigations of criminalistics tracks with biomechanical content and in decoding information from criminalistics relevant events that originated as a consequence of human motion activity and that is related to the investigated event. Forensic biomechanics investigates and explains this domain of criminalistics tracks that inherently contain biomechanical content, i.e. given applications give out information on muscular and skeletal form of an offender or his / her motion behaviour. Forensic biomechanics has the subject of investigation in common intersection of biomechanics and criminalistics. In a creative way it applies investigation biomechanical methods, procedures and ways of solutions of biomechanics to criminalistics problems. Forensic biomechanics studies and investigates motion system and human motion behaviour that are related to criminal act and left behind criminalistics tracks that inherently contain biomechanical content. The denotation "forensic" biomechanics means "judicial" biomechanics, as well as the application of biomechanics in the investigation and examination of criminalistics tracks[3].

Forensic biomechanics applies biomechanics and its cognitive methods to two important directions of investigation, namely:

– criminalistics tracks with biomechanical content
– criminalistics relevant changes that originated as the consequence of mechanical interaction of system "human-vicinity"

The summary of the present expert practice since beginning the use of expert opinions in the field "Criminalistics, specialisation forensic biomechanics" leads to the knowledge generalisation and to outlining the present direction of forensic biomechanics development. A hundred opinions of the specialisation "Forensic biomechanics" processed in the cases that were concluded by court authority were selected for this paper. The total number of the collected opinions is a sufficiently great number of cases from the viewpoint of mathematical statistics and enables us to show how forensic biomechanics is used. The following table summarises the processed expert opinions from the 1994-2007 time period ranked according to problem[4].

Problems	Number of cases
Biomechanics of the fall from height – judgement of cause by a strange person, impact of extrinsic force	43
Extreme dynamic burden of organism – usually strokes to head, judgement of question of organism tolerance, surviving the origination of fracture of cranial bones	24
Fall from a stand on the ground, fall from stairs – judgement of the fall course, possibility of strange cause, causes of the fall	15
Biomechanical analysis of walk - identification of a person according to the walk stereotype, determination of geometric characteristics of persons	4
Analysis of a conflict combat – determination of reaction times, possibilities of strength impact, reality of protective reactions	4
Traffic incidents – mechanical impact on traffic incident participants being inside a vehicle and mechanical impact on a run down person	3
Knifing – strength impact at knifing, possibility of participation of the second person, determination of force to skin piercing	2
Biomechanical content of run tracks of local motion – prediction of physical tallness and of the way of local motion according to the left tracks of local motion	1
The other – sporadic cases, e.g. a person's injure by a smash-cast grenade, injure of ligaments in knee in a combat, shaking the child's head, halter, a fatal injure jump to distance	4
Total	100

3 STRAUS, J. *Aplikace forenzní biomechaniky*. Praha: Police history, 2001, s. 17

4 The survey includes expert opinions processed by V. Karas, obtained from him by the author as a gift during his life and from his inheritance and the own expert opinions.

The given table shows the percentage distribution of investigated cases of two experts (Professor Karas and Professor Straus, the author).

It is remarkable that in practice the investigation of biomechanical content of run tracks of local motion has not been spread to higher extent. Scientific researches are very well processed in this direction, they have a lot of mathematical dependences for the prediction of physical tallness from tracks in different disperse surround at disposal, but they have not been realised in practice. It is evident that the tracks of local motion have not been found, although the research of biomechanical content of the run tracks of local motion instigated the identification of persons according to the dynamic walk stereotype. In the last five years, the research of human local motion has transformed to the identification of persons according to the dynamic walk stereotype.

The text below deals with the obtained experiences from the use of forensic biomechanics.

Biomechanics of the fall from a stand is a very frequent application and from the viewpoint of forensic biomechanics it is a relatively well investigated application[5]. The current research branches into two directions. Firstly, it is an experimental research that studies human body motion divided into phases of the fall or jump from a stand. The persons participating in the experiment jump from a tower into the water, their motion is recorded and consecutively analysed with time sampling 40 ms. The motion of the centre of gravity of a body and rotation of individual axes of body[6] are studied. The second research direction is aimed to analysis of criminal cases. We cumulate well documented real cases of the victim's fall, e.g. documented suicides, murders, unfortunate events. By assembling and comparing experimental biomechanical values and real cases we have sufficient material for the real programming and analysis of the fall of a human body from the stand. For the reconstruction of biomechanics of the fall of a human body from the stand, we created the PC program "FALL-BODY", that allows the researchers to simulate the human body fall in 3D space according to the given input parameters. This lucidly allows the reconstruction of individual variants of the fall differentiating three cases, e.g. the variant of an active jump, an unfortunate event (sliding) or the variant of active outer force (pushing by other person). A model approach for the solution, e.g. biomechanics of falls, is always limited because the object is a biological system that in some situations does not behave as multilateral mechanisms of relatively stiff elements. Therefore, in this direction we perform a broad comparison of experimental data and analysis of well documented criminal acts.

According to the researchers' own experiences the biomechanical analysis of the fall from a stand enables them to solve questions of the following type:

1) Was the fall from a stand spontaneous, without attached outer forces, i.e. does a person fall without a strange cause, without being pushed, possibly without his own rebound?
2) Was the vice versa fall caused and impact affected by outer forces, i.e. does a person rebound or was he pushed?
3) Is it possible to calculate the size of affected outer force at the moment of the loss of contact?
4) Does the distance of the body landing from a vertical line correspond to a probable height of the fall?
5) In case that a person rebounds, is it possible roughly to calculate the size of vector of velocity of the rebound?
6) Is it possible according to the fall and landing to judge on suicide jump or unfortunate event or intentional pushing out by second person?

Extreme dynamic burden of organism represents a situation, in which an attacker assails a victim with a stroke by fist, stone, hammer, baseball bat or by some other solid thing. Most frequently the attack is directed to the head of a victim because the brain is an important vital organ. In case of these biomechanical analyses, we have taken into account the judgement of an organism resistance, its tolerance to outer loading. Forensic biomechanics enables a precise quantification of organism tolerance to outer loading, it is possible to calculate what stroke leads to the bruise of

5 STRAUS, J. a kol. *Biomechanika pádu z výšky.* Praha: PA ČR, 2004.

6 The experimnet tested the falls of a body rescued by jumping on a fire fighter canopy – the falls of a human body model or a scale body model. The falls into a swimming pool showed as optimal.

the brain tissue, bound fracture and accordingly it allows the researchers to deduce if the assailed person died immediately or lived for awhile and whether theoretically it was possible to rescue him / her[7]. Principally, it is important to determine and quantify the boundary important for surviving at mechanical extreme loading the head of a victim. For the variants of the calculation of dynamic loading the head of a human body from a stand, we compiled the PC program "IMPACT-HEAD" that allows the simulation and calculation of critical values of tolerance of an organism resistance, shock component of force for the origin of the fracture of cranial bones, the origin of unconsciousness or destruction of the brain tissue. The PC simulation in the 3D space works according to the input parameters.

In this direction of application it is possible to solve the following questions:

1) Biomechanical description of motoric behaviour at which injury of an impaired person originated.
2) What is the strength of the force and energy originated at stroke and whether a person is capable to produce it, whether it corresponds to the description of motor behaviour?
3) Whether the values of outer loading are capable to cause the injury detected in the head.
4) To express the boundary of an organism tolerance to outer loading.
5) To judge the ways of physical attack of the injured person.
6) To express the probability of the course of physical conflict (attack) of the accused person and injured person from the biomechanics point of view.
7) To express the number of strokes to the head, eventually to the body.

The research very precisely describes the behaviour of a human body and its parts to outer loading and quite precisely quantifies the organism tolerance[8].

The fall from a stand on the ground, the fall from stairs Falls from a stand on the ground are relatively frequent biomechanical problems. From the viewpoint of biomechanics, we distinguish three types of incidents at walk leading to falls. They are sliding, tripping and stumbling followed by a fall. Biomechanical literature recognizes these three kinds of incidents described and clearly distinguished not only according to the way of origin but also according to the determining step – the direction of the fall, the distance of landing from the origin of the fall, the place of body landing, the final position or orientation of a body and nature and extent of the injury. This detailed information must be in-depth founded for an objective judgement of the course and cause of the fall. This type of falls is frequent at two age different groups. It is often detected with young teenagers as a consequence of falling from on-line skates or skateboards and with old people who trip as a consequence of bad motor co-ordination of motions during the walk. Criminalistics also recognizes important cases in which an attacker pushes a victim; the victim falls and gets injured and it is important to judge the fall of an attacked person and find out whether it is a direct consequence of the stroke or it originated from a secondary phenomenon.

Biomechanics of the fall from a stand on the ground and falls from stairs enables us to solve the following questions based on experience:

1) To judge the mechanisms of the fall from the viewpoint of biomechanics.
2) If the fall was spontaneous without attached outer forces (i.e. strange cause – pushing).
3) Was landing caused by the action of outer force?
4) Whether the described injuries could be caused by a spontaneous fall without the participation of a second person.
5) Whether the action of outer force of another person is taken into account.
6) In case of the participation of some other person, to express the size and direction of the action of force.
7) Whether the mechanisms of injury corresponds to the given explanation.

7 STRAUS, J. *Biomechanika tupého poranění organismu*. Praha: PA ČR, 2000; STRAUS, J., Tolerance lebky a mozku na vnější mechanické působení. *Soudní inženýrství*, 18, 2007, č. 1, s. 42-49

8 STRAUS, J. Balance of Mechanical Energy at External Head Impact. Research Papers: *Criminalistics and Forensic Examination: Science, Studies, Practice*. Vilnius 2007, s. 169-173; STRAUS, J., PORADA, V. Forensic Biomechanical Application in Criminalistics. *Forensic Science International.* Volume 169, Supplement 1, 2007, s. 40 STRAUS, J. Balance of Mechanical Energy at External Head Impact. Research Papers: *Criminalistics and Forensic Examination: Science, Studies, Practice*. Vilnius 2007, s. 169-173

Biomechanical analysis of walk is a very perspective application. The problem of identifying persons according to their walk is not a new matter (the first application appeared at the beginning of the 90s[9]). It is a very interesting domain, particularly for its application in the domain of security. At present the research connected with the identification of persons according to the dynamic stereotype of walk is very intensively studied abroad[10] and in the Czech Republic[11], too. In comparison with other biometric identification methods, the identification according to the walk has many advantages. One of them is the live shots taken by a video camera, and the fact that the shots may be recorded at relatively low recognition. Accordingly, it follows that the observation may be performed from a relatively great distance while the person is not aware that he / she is monitored, i.e. the identification according to the walk is a non-invasive method. It is also hard to suppress the walk in comparison e.g. face because humans need to move. These characteristics made up from the identification according to the walk are relatively attractive biometric characteristics. The disadvantage of identifying a person according to the walk is that, even though each person theoretically has a unique walk under ideal conditions, the change of conditions (e.g. clothing, light conditions, the angle of a camera or even the velocity of the walk) may cause more deviations with one person then between two different persons, moreover humans can intently change the way of their walk. These circumstances lead to the following discussions - how precise the identification according to the walk may be. Identification features performed at the Police Academy of the Czech Republic confirm the fact that the dynamic stereotype of each person is unique and it is possible to identify a person according to his / her walk. The research findings allow, apart from individual identification of a person, to calculate some supplementary characteristics as it is e.g. the person's height. Many studies using different parameters with different results have been published. Some of these methods are relatively time consuming and require storing and analysis of many data.

With regard to the experience, the bodies active in criminal actions require the answer to the following questions:

1) To calculate the height of a person, pertinently bulky characteristics of a person.
2) To carry out individual identification of person.

Further, the main aims of other applications of forensic biomechanics and similar subjects of the investigation according to experience and findings consulted with police commissioners are given.

Analysis of a conflict combat is used in cases in which there is a physical attack of a person; the affected person and the attacker present different versions of the course of a physical conflict. An expert investigation shall evaluate the question dealing with possible courses of movements. Most frequently, it is the judgement of the time of the reaction of motor behaviour and the velocity of a stroke performance, the head turning away, the speed of defensive reactions etc. In these cases it is necessary to take into account the possible training of the participants in fight, whether the push was from the guarding position, with preparation, without preparation etc.

Traffic incidents use the biomechanical investigation for the assessment of mechanical action on traffic incident participants inside a vehicle and mechanical action on injured persons. An expert investigation may determine the position of persons inside the vehicle during the traffic incident, as well as a critical bump velocity and the origin of the injuries of persons fastened by safety belts. For instance, if a vehicle bumps on an object and the persons inside get injured, a biomechanical investigation may determine whether the driver or co-driver were fastened by safety belts.

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9 The grounds for the identification of persons according to their walk were established by JOHANSSON (JOHANSSON, G. Visual motion perception *Scientific American*, (232):76–88, 1975) in his experiments with the display of light points (in literature denoted as the PLD). His experiments proved the capability of persons to distinguish another person according to the way of walk only on the basis of observation of 2D curves created by fixing bulbs on persons.

10 NIXON, M. S., et. al. Automatic Gait Recognition, *In:* A. K. Jain, et al. Eds., *Biometrics: Personal Identification in Networked Society*, pp 231-250, Kluwer, 1999; NIXON, M.S.. CARTER, J.N.NASH, J.M HUANG, P.S. CUNADO, D. Stevenage, S.V. Automatic gait recognition. In *Motion Analysis and Tracking (Ref. No. 1999/103), IEE Colloquium on*, pages 3/1–3/6, 1999; NIXON, M.S., TAN, T.N., CHELLAPPA, R. *Human Identification Based on Gait.* Springer-Science+Business Media Inc., 2006; ABDELKADER, C. B., CUTLER, R., NANDA, H., DAVIS, L. EigenGait: Motion-Based Recognition Using Image Self-Similarity, *LNCS* 2091, 2001, pp 289-294; LYNNERUP, N, VEDEL, J. Person Identification by Gait Analysis and Photogrammetry. *J. Forensic Sci.,* 50, 1, s. 112-118.

11 STRAUS, J., JONÁK, J. Lokomoce člověka z hlediska forenzní biomechaniky. *Pohybové ústrojí*, 11, 2004, č. 1-2, s. 130-131; STRAUS, J., JONÁK, J. Je možné identifikovat osobu podle pohybového projevu lokomoce ? *Policajná teória a práx*. 3, 2005, s. 109-120

Knifing is also relatively frequent. A biomechanical analysis investigates the size of force that must be produced while stabbing a person; the next possibility is the participation of another person and his active role in the incident.

Biomechanical content of the run tracks of local motion is really a rarely used application, even though theoretical findings are very prosily processed. The practice has solved only one case of the prediction of the tallness of an offender and the way of local motion according to the tracks left in the ploughed land.

The others are single cases and sometimes very strange, e.g. injuries of persons caused by a thrown grenade (pupils throw grenades during a physical education class and injured their teacher), then injuries of knee ligaments caused in a combat, the contusion of the child's brain caused by shaking (father has shaken the child with intent to knock out the bead from its respiratory path causing intracranial bleeding of the child), hanging (judgement of motion behaviour of felo-de-se at hanging on a tree branch), fatal injury caused by distance jumping (a pupil participating in an athletic contest unhappily fell on a concrete margin of a pit and injured his liver; the biomechanical judgement solved the variant, resolving whether the pit was made from soft material) etc.

CONCLUSION

The performed analysis of expert opinions from the field "Criminalistics, specialisation forensic biomechanics" enables real judgement of the present directions of the development of forensic biomechanics in criminalistics according to the experience of expert practice. The paper analyzes a set of cases compiled by two experts, for which there is an expert opinion from the field "Criminalistics, specialisation forensic biomechanics". It is evident that problems of forensic assessment of falls and local motion are substantially multifarious with possible interference of different psychomotor influences that can modify proper fall mechanics.

According to the analysis of expert opinions it is possible to determine the percentage of the distribution of the cases solved by two experts (professor Karas and the author) on the basis of 100 real closed cases. Practical application of forensic biomechanics in criminalistics according to the experience are recognized in following directions – fall biomechanics (43%), judgement of extreme dynamic loading the organism (24%), the biomechanical analysis of the fall from a stand on the ground or the fall from stairs (15%), the biomechanical analysis of walk (4%) and the analysis of conflict (4%). These directions represent 90% of all processed expert opinions. According to practical experiences it is possible to assume that the used directions will also develop and determine research trends in future.

In the end, it is necessary to remark that opinions given in the paper presenting the outline of the directions of the development of forensic biomechanics in criminalistics in the Czech Republic were drawn from the experience and expert practice and also from Professor Karas's expert practice. The discussion about the trends and possible specification and supplement will be very useful for the further development. The degree of cognition of new ideas and theories only originates in conflicts of opinions and in a correct scientific discussion.

REFERENCES

1. ABDELKADER, C. B., CUTLER, R., NANDA, H., DAVIS, L. EigenGait: Motion-Based Recognition Using Image Self-Similarity, *LNCS* 2091, 2001, pp 289-294;
2. BHATNAGAR,D. P., THAPAR, S. P., BATISH, M. K. Identifiation of personal height from the somatometry of the hand in punjabi males. *Forensic Science International*, 24,1984, pp. 235-247
3. JOHANSSON, G. Visual motion perception. *Scientific American*, (232):76–88, 1975.
4. KARAS, V. Biomechanika pohybového aparátu člověka. Praha: UK, 1978
5. LYNNERUP, N, VEDEL, J. Person Identification by Gait Analysis and Photogrammetry. *J. Forensic Sci.*, 50, 1, s. 112-118.
6. MUSIL, J., KONRÁD, Z., SUCHÁNEK, J. *Kriminalistika.* 2. přeprac. A dopl. vyd., Praha: C. H. Beck, 2004.

7. NIXON, M. S., et. al. Automatic Gait Recognition, *In:* A. K. Jain, et al. Eds., *Biometrics: Personal Identification in Networked Society*, pp 231-250, Kluwer, 1999;
8. NIXON, M.S.. CARTER, J.N.NASH, J.M HUANG, P.S. CUNADO, D. Stevenage, S.V. Automatic gait recognition. In *Motion Analysis and Tracking (Ref. No. 1999/103), IEE Colloquium on*, pages 3/1–3/6, 1999;
9. NIXON, M.S., TAN, T.N., CHELLAPPA, R. *Human Identification Based on Gait.* Springer-Science+Business Media Inc., 2006;
10. PORADA, V. Teorie kriminalistických stop a identifikace. Praha: Academia, 1987
11. ROBBINS, L. M. Eastimating Height and Weight from Size of Footprints. *Journal of Forensic Sciences*, 1986, 31, 1, pp. 1056-1071
12. STRAUS, J., JONÁK, J. Lokomoce člověka z hlediska forenzní biomechaniky. *Pohybové ústrojí*, 11, 2004, č. 1-2, s. 130-131,
13. STRAUS, J., JONÁK, J. Je možné identifikovat osobu podle pohybového projevu lokomoce ? *Policajná teória a práx.* . 3, 2005, s. 109-120
14. STRAUS, J. a kol. *Biomechanika pádu z výšky.* Praha: PA ČR, 2004.
15. STRAUS, J. *Biomechanika tupého poranění organismu*. Praha: PA ČR, 2000
16. STRAUS, J., Tolerance lebky a mozku na vnější mechanické působení. *Soudní inženýrství*, 18, 2007, č. 1, s. 42-49
17. STRAUS, J. *Aplikace forenzní biomechaniky*. Praha: Police history, 2001
18. STRAUS, J., VAVERA, F. *Dějiny československé kriminalistiky slovem i obrazem II.* Praha: Police history, 2001
19. STRAUS, J., PORADA, V. Forensic Biomechanical Application in Criminalistics. *Forensic Science International.* Volume 169, Supplement 1, 2007, s. 40
20. STRAUS, J. Balance of Mechanical Energy at External Head Impact. Research Papers: *Criminalistics and Forensic Examination: Science, Studies, Practice*. Vilnius 2007, s. 169-173
21. ZACIORSKIJ,B.M., ARUJIN,A.S., SELUJANOV,V.N. *Biomechanika dvogatělnogo aparata čeloveka*. Moskva: Fizkultura i sport, 1981, s. 78 - 89.

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FORENSIC INSTITUTIONS ACCREDITATION AS AN IMPERATIVE OF EU

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Abstract: Intensifying of forensic evidence and information exchange between European countries emphasizes the necessity of common forensic standards in EU countries and countries candidates for EU membership. Confidence that certain forensic data (such as DNA profiles and fingerprints) can be exchanged is provided by forensic laboratories ISO/IEC 17025 accreditation "General requirements for competency of analyzing and calibrating laboratories". Introducing quality standards ISO/IEC 17025 is also significant for potential access to European forensic databases according to Pruem treaty. In this publication, standard ISO/IEC 17025 requests which forensic laboratory is supposed to fulfill, as well as EU documents, which regulates these issues will be presented. The documents represent general EU decisions 2009/905/JHA and Council conclusions on the vision for European Forensic Science 2020 including the creation of a European Forensic Science Area and the development of forensic science infrastructure in Europe.

Keywords: accreditation, forensic databases, quality standards ISO/IEC 17025

INTRODUCTION

For standardisation in forensics precise standards regarding different parts of forensic activities have to be defined. In order to profecionalize forensic activities, they have to fullfill the following criteria:

1) Internationally recognised standards in the field of forensics[1].
2) Should act accordingly to finalised and defined procedures in every field of work,
3) Should prepare instructions for work, as a result of the best national praxis

Accreditation is a procedure in which authorised institution (national accreditation body[2]) evaluate certain institution and formaly recognises that the institution in question is technically and profesionally competent for performing certain actions according to internationally accepted norms (in this case quality standard ISO/IEC 17025).

Accreditation and certificate of accreditation proves competence for performing specific analyses (in this case forensic analyses) according to requirements of the norm (ISO/IEC 17025). Accreditation is internationally recognised mean for securing confidence in work of institutions, government administration authorised for analyses, examinations, measurements and inspections in order to protect public interests.

Accreditation provides increasing of organicational and technical work competence of laboratories.

1 As a confirmation for this criteria, it is important to give the following example. European Network of Forensic Science Institutes (ENFSI), an organization that monitors activities and development in the field of forensics in EU, carries on a project of accreditation of forensic laboratories by European quality standard ISO/IEC 17025. That means that all forensic laboratories in Europe (especially ENFSI members) have to accredit by this quality norm exclusively. Forensic Center in Ministry of Internal affairs in Moscow was accredited by Russian quality norm, by Russian Metrology Institute, and that was the reason why it was excluded from ENFSI membership on annual conference in Prague in 2010. Exclusion from ENFSI, as only referent European association, leads to loosing credibility of forensic laboratory, and confidence in validity and reliability of laboratory's results. Standards in forensics required by ENFSI and the EU are the results of the best practice given by the instructions and procedures made by experienced experts, and they were several times assessed, altered, upgraded and improved. Not implementing the standard in Forensic Center of Russian Federation can have significant consequencies. Having in mind the fact that 16000 employees annualy process 2 000 000 requests for forensic expertise.

2 It is important to emphasize that national assrecitation bodies of European country has to be a member of European cooperation for accreditation (EA www.european-accreditation.com.)

Accreditation brings confidence in analyses security and quality under the inspection of competent organisations which fullfill internationaly accepeted criterias.

Difference between accreditation and certification is that the accreditation proves competence for performing certain analyses and examinations, measurements, certifications and technical inspections, while certification confirms compliance of system with the certain norm or specification.

Quality of analyses and results of forensic laboratories are very significant for judiciary system, legislative, crime prevention, health policies, as well as for international harmonisation, exchange and coordination of informations and forensic data around the world.

Compatibility and acceptance of laboratory results between different countries is simplified by their compliance with ISO/IEC 17025:2005 – international quality standard for testing and calibrating laboratories, according to recommendations of International Laboratory Accreditation Cooperation ILAC-G 19:2002 for forensic science labs. Compatibility with ISO 17025 also secures compatibility with ISO 9001 requirements, which alone cannot be replacement for ISO 17025 compliance, and is not sufficient for technical competency laboratories for testing.

Quality management system and accreditation of forensic examinations, analyses, and expert assessment is of highest significance in EU countries in the past several years. Along with the EU countries, Montenegro and Serbia have taken part in accreditation process of Forensic Center, Police Directorate in Montenegro and National Criminalistic - technical Center, Ministry of Internal Affairs in Serbia. The reason for that is that both institutions are full time members of ENFSI (European Network of Forensic Science Institutes, www.enfsi.eu), an organization that monitors activities and development in the field of forensics in EU. Also, both before mentioned institutions are active participants of EMFA-2 project (European Mentorship for Forensic Accreditation).

ACCREDITATION OF FORENSIC LABORATORIES IN THE EU

Accreditation of forensic laboratories in the EU started for practical purposes. Cross-border criminality and terorism forced EU countries for intensive operative police cooperation. That cooperation covers operative forensic cooperation, where as the major role stands for cross-border exchange of forensic forensic data, as DNA profiles, fingerprints, biometric and other forensic data.

That lead to a frequent situation that forensic data acquired in one country are used in as an evidence in police and court of another country, and that is why implementing general standards in European countries was neccessary. Of course, the leading role in this proces had EU, as single international entity that guaratees high law and security standards. Primarily, EU Council adopted the resolution 208/615/JHA on June 23th, 2008 „Stepping up of cross-border cooperation, particularly in combating terrorism and cross-border crime". This decision enabled that EU countries start more efficient exchange of forensic data and identification of persons suspects for international crimes and terorism. For this decision to be reliable, operatively acceptable and legaly normed, it was neccessary to be modified. So, EU Council on November 30th, 2009 adopted the decision 2009/905/JHA on forensic institutions accreditation in EU countries, which is directed towards securing confidence, compatibility and usability of forensic data (DNA profiles and fingerprints at present) from one country to another.

The EU Council decision 2009/905/JHA commits all EU countries to have at least one forensic institution accredited by international quality atandard ISO/IEC 17025. Article 5 of EU Council decision 2009/905/JHA indicates that every member country should comply with strict conditions required by ISO/IEC 17025 quality standard for recognising its forensic examinations, analyses, expert assessments. Article 7 of forementioned decision, requires the following from the member countries:

- Accreditation of DNA laboratories untill November 30th, 2013
- Accreditation of fingerprint laboratories untill November 30th, 2015
- Inclusion of the EU Council decision 2009/905/JHA in national legislation untill May, 30th, 2016
- EU Council will perform the inspection of implementation of the decision till the end of 2018

All the activities in forensics are mediated by ENFSI, by its Committee for Quality and Competence. In this year's Committee's report presented in its regular annual meeting, all EU countries have accredited forensic laboratories by standard norm ISO/IEC 17025. In the report there are no informations about Denmark and Portugal, and Greece since 2010 is not an ENFSI member and there are no official data whether it has accredited forensic DNA lab.

Non-EU countries, but planning to become ones, as Montenegro and Serbia, are in process of accrediting its institutions in order to become part of forensic entity of the EU. In that way, both Montenegro and Serbia actively take part in international exchange of forensic data regarding solving cross-border crime and terorism.

Accreditation of Forensic Center, Police Directorate in Montenegro and National Criminalistic - Technical Center, Ministry of Internal Affairs in Serbia is part of EMFA-2 project. EMFA-2 project is based on twinning laboratories in the following manner: one accredited laboratory acts as mentor to another lab that is in process of accreditation. The project is organized by ENFSI, and financed by the EU. 8 laboratories participate in the project, 4 accredited and 4 non'accredited:

Training laboratory	Mentor laboratory
Forensic Center, Montenegro	Forensic Center, Estonia, Tallinn
Forensic Center, Serbia	Forensic Center, Croatia
Forensic Center, Federation of Bosnia and Herzegovina, Sarajevo	Forensic Center, Slovenia, Ljubljana
Forensic Center, Russia, Saint Petersburg	Forensic Center, Latvia, Riga

Project EMFA-2 started in 2010 I will last until the end of 2013, when the finalization of accreditation process in all the training laboratories is expected

Project EMFA means the EU mentorship in documentation for standardization and quality control, forensic laboratory management and methods validations.

CONCLUSION

Quality standards in forensic examinations, analyses, expert assessments, is of great significance for cross-border cooperation against international crime and terorism. Standards cover the whole forensic proces from the momment when the police arrives to the crime scene, laboratory analyses, results interpretations and reports, to the presentation of the opinion in the court. They are general, and that is why they are useful for all forensic disciplines – crime scene investigation, forensic medicine, DNA analyses and so on. Profesionalisation by accrediting activities of forensic sciences, whith their results used in courts of other countries, is an important part of EU progress, as functional entity of freedom, security and juctice.

EU has brought several decisions which commit its members to implement quality standards in forensics. Among most recent decisions were Council conclusions on the vision for European Forensic Science 2020 including the creation of a European Forensic

Science Area and the development of forensic science. The document indicates that Council of Ministers of Justice in cooperation with EUROPOL and ENFSI has evolved a detailed action plan for implementing a project European Forensic infrastructure 2020. This document obliges EU member countries for development in 10 forensic field, and most important among them is forensic laboratories accreditation.

LITERATURE

1. ENFSI Board (2005), BRD-GEN-003 Code of Condact.
2. ENFSI Standing Committee for Quality and Competence - QCC (2004), QCC_CAP_003 Performance Based Standards for Forensic Science Practitioner

3. Caddy, B., Thorpe, J.W. (1998) Communication Skills and Expertise in the Inquisitorial and Adversarial Legal System, ENFSI Meeting Madrid
4. Golja, J. (2004). Kriminalističnotehnično izvedenstvo v Evropi in v Sloveniji. Dnevi varstvoslovja – zbornik, povzetek 98
5. Golja, J. (2007). Kriminalističnotehnični dokaz. Posvet dokazovanje v težkih primerih, UNI Maribor. Maribor
6. Golja, J. (2010). Forenzika u Evropskoj Uniji. Expertus Forensis No 14-15. Udruženje sudskih vještaka Crne Gore.
7. Ivanović, A., Merike Rump (2011), ACCREDITATION PROCESS FORENSIC CENTER OF MONTENEGRO TO THE MENTORSHIP OF THE EUROPEAN UNION (Projects EMFA-2). 10th Symposium of forensic sciences. Bratislava. Symposium Journal.
8. Simonović, B. (2009). Standardizacija i akreditacija kao jedan od načina profesionalizacije policijske i kriminalističke službe. Bezbednost No 1-2/2009.
9. ENFSI project (2003). QC-CAP-003. Performance Based Standards for Forensic Science Practitioners.
10. ENFSI Strategic plan 2008-2011 (2008)
11. ENFSI DNA Working Group (2010). DNA-Data Management, Rewiew and Recommendations.
12. COUNCIL FRAMEWORK DECISION 2009/905/JHA of 30 November 2009 on Accreditation of forensic service providers carrying out laboratory activities,
13. Council conclusions on the vision for European Forensic Science 2020 including the creation of a European Forensic Science Area and the development of forensic science infrastructure in Europe *3135th JUSTICE and HOME AFFAIRS Council meeting Brussels, 13 and 14 December 2011*

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CHROMATOGRAPHY AS A FORENSIC METHOD IN CRIMINALISTIC IDENTIFICATIONS

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Abstract: Few methods of chemical analysis are truly specific to a particular analyte. It is often found that the analyte of interest must be separated from the number of individual compounds that may be present in a sample. As well as providing the analytical scientist with methods of separation, chromatographic techniques can also provide methods of analysis. Chromatography involves a sample (or sample extract) being dissolved in a *mobile phase* (which may be a gas, a liquid or a supercritical fluid). The mobile phase is then forced through an immobile, *stationary phase*. The phases are chosen such that components of the sample have differing solubilities in each phase. A component which is quite soluble in the stationary phase will take longer to travel through it than a component which is not very soluble in the stationary phase, but very soluble in the mobile phase. As a result of these differences in mobilities, sample components will become separated from each other as they travel through the stationary phase.

Techniques such as H.P.L.C. (High Performance Liquid Chromatography) and G.C. (Gas Chromatography) use *columns* – narrow tubes packed with stationary phase, through which the mobile phase is forced. The sample is transported through the column by continuous addition of mobile phase. This process is called *elution*. The average rate at which an analyte moves through the column is determined by the time it spends in the mobile phase.

In this paper, we'll take a closer look at **chromatography** that is based on Henry's Law of equilibrium, that a volatile compound (in transition from solid, gas, or liquid states) will have a fixed ratio of molecules escaping and staying. All substances reach this point of equilibrium at different speeds, known as the time of elution (which accounts for the separation of component molecules). Machines exist that record these times of elution by applying a heat source (volatility) to an injection of sample through a tube or chamber filled with a carrier medium (gas or liquid), the recording being called a chromatograph.

Keywords: chromatography, chemical analysis, analyte, mobile phase, stationary phase, elution, Henry's Law of equilibrium, volatile, soluble.

INTRODUCTION

Gas chromatography (GC), is a common type of *chromatography* used in *analytical chemistry* for *separating* and analyzing compounds that can be *vaporized* without *decomposition*. Typical uses of GC include testing the purity of a particular substance, or separating the different components of a mixture (the relative amounts of such components can also be determined). In some situations, GC may help in identifying a compound. In *preparative chromatography,* GC can be used to prepare pure compounds from a mixture.

In gas chromatography, the *mobile phase* (or "moving phase") is a carrier *gas,* usually an *inert* gas such as *helium* or an *unreactive* gas such as *nitrogen*. The *stationary phase* is a microscopic layer of *liquid* or *polymer* on an inert *solid* support, inside a piece of *glass* or *metal* tubing called a column (a homage to the *fractionating column* used in distillation). The instrument used to perform gas chromatography is called a *gas chromatograph* (or "aerograph", "gas separator").

The gaseous compounds being analyzed interact with the walls of the column, which is coated with a stationary phase. This causes each compound to *elute* at a different time, known as the *retention time* of the compound. The comparison of retention times is what gives GC its analytical usefulness.

Gas chromatography is in principle similar to *column chromatography* (as well as other forms of chromatography, such as **High-Performance Liquid Chromatography** (*HPLC*), **Thin Layer Chromatography** (*TLC*)), but has several notable differences. Firstly, the process of separating the compounds in a mixture is carried out between a liquid stationary phase and a gas mobile phase, whereas in column chromatography the stationary phase is a solid and the mobile phase is a liquid. (Hence the full name of the procedure is "Gas-liquid chromatography", referring to the mobile and stationary phases, respectively.) Secondly, the column through which the gas phase passes is located in an oven where the temperature of the gas can be controlled, whereas column chromatography (typically) has no such temperature control. Thirdly, the concentration of a compound in the gas phase is solely a *function* of the *vapour pressure* of the gas.

Gas chromatography is also similar to *fractional distillation*, since both processes separate the components of a mixture primarily based on *boiling point* (or vapour pressure) differences. However, fractional distillation is typically used to separate components of a mixture on a large scale, whereas GC can be used on a much smaller scale (i.e. microscale).

Gas chromatography is also sometimes known as **vapour-phase chromatography** (VPC), or **gas–liquid partition chromatography** (GLPC). These alternative names, as well as their respective abbreviations, are frequently used in scientific literature. Strictly speaking, GLPC is the most correct terminology, and is thus preferred by many authors.[1]

GC ANALYSIS

A **gas chromatograph** is a chemical analysis instrument for separating chemicals in a complex sample. A gas chromatograph uses a flow-through narrow tube known as the *column*, through which different chemical constituents of a sample pass in a gas stream (carrier gas, *mobile phase*) at different rates depending on their various chemical and physical properties and their interaction with a specific column filling, called the *stationary phase*. As the chemicals exit the end of the column, they are detected and identified electronically. The function of the stationary phase in the column is to separate different components, causing each one to exit the column at a different time (*retention time*). Other parameters that can be used to alter the order or time of retention are the carrier gas flow rate, column length and the temperature.

In a GC analysis, a known volume of gaseous or liquid *analyte* is injected into the "entrance" (head) of the column, usually using a micro *syringe* (or, solid phase microextraction fibers, or a gas source switching system). As the carrier gas sweeps the analyte molecules through the column, this motion is inhibited by the *adsorption* of the analyte *molecules* either onto the column walls or onto packing materials in the column. The rate at which the molecules progress along the column depends on the strength of *adsorption*, which in turn depends on the type of molecule and on the stationary phase materials. Since each type of molecule has a different rate of progression, the various components of the analyte mixture are separated as they progress along the column and reach the end of the column at different times (retention time). A detector is used to monitor the outlet stream from the column; thus, the time at which each component reaches the outlet and the amount of that component can be determined. Generally, substances are identified (qualitatively) by the order in which they emerge (elute) from the column and by the retention time of the analyte in the column.

1 Pavia, Donald L., Gary M. Lampman, George S. Kritz, Randall G. Engel (2006). *Introduction to Organic Laboratory Techniques (4th Ed.)*. Thomson Brooks/Cole. pp. 797–817. ISBN 978-0-495-28069-9.

PHYSICAL COMPONENTS

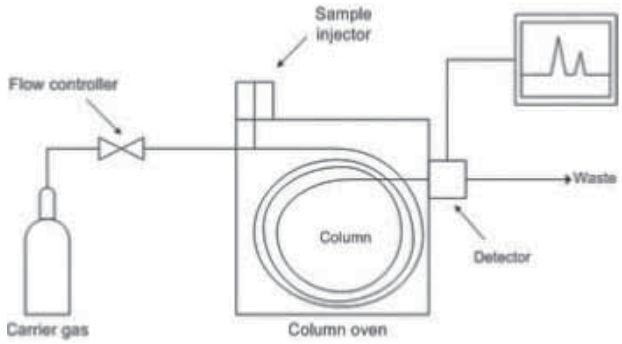

Diagram of a gas chromatograph.

DETECTORS

The most commonly used detectors are the *flame ionization detector* (FID) and the *thermal conductivity detector* (TCD). Both are sensitive to a wide range of components, and both work over a wide range of concentrations. While TCDs are essentially universal and can be used to detect any component other than the carrier gas (as long as their thermal conductivities are different from that of the carrier gas, at detector temperature), FIDs are sensitive primarily to hydrocarbons, and are more sensitive to them than TCD. However, an FID cannot detect water. Both detectors are also quite robust. Since TCD is non-destructive, it can be operated in-series before an FID (destructive), thus providing complementary detection of the same analytes.[2]

Other detectors are sensitive only to specific types of substances, or work well only in narrower ranges of concentrations. They include:

- Thermal Conductivity detector (TCD), this common detector relies on the thermal conductivity of matter passing around a tungsten-rhenium filament with a current traveling through it.[3] In this set up helium or nitrogen serve as the carrier gas because of their relatively high thermal conductivity which keep the filament cool and maintain uniform resistivity and electrical efficiency of the filament.[4] However, when analyte molecules elute from the column, mixed with carrier gas, the thermal conductivity decreases and this causes a detector response. The response is due to the decreased thermal conductivity causing an increase in filament temperature and resistivity resulting in fluctuations in voltage. Detector sensitivity is proportional to filament current while its inversely proportional to the immediate environmental temperature of that detector as well as flow rate of the carrier gas.
- Flame Ionization detector (FID), in this common detector electrodes are placed adjacent to a flame fuelled by hydrogen / air near the exit of the column, and when carbon containing compounds exit the column they are pyrolyzed by the flame. This detector works only for organic / hydrocarbon containing compounds due to the ability of the carbons to form cations and electrons upon pyrolysis which generates a current between the electrodes. The increase in current is translated and appears as a peak in a chromatogram. FIDs have low detection limits (a few picograms per second, but they are unable to generate ions from carbonyl containing carbons. FID compatible carrier gasses include nitrogen, helium, and argon.
- Catalytic combustion detector (CCD), which measures combustible hydrocarbons and hydrogen.

2 "Gas Chromatography". ACRF. http://www.gas-chromatography.net/gas-chromatography.php. Retrieved on 11 March 2012.
3 Harris, Daniel C. (1999). "24. Gas Chromatography". *Quantitative chemical analysis* (Chapter) (Fifth ed.). W. H. Freeman and Company. pp. 675–712. ISBN 0-7167-2881-8.
4 Higson, S. (2004). Analytical Chemistry. OXFORD University Press ISBN 978-0-19-850289-0.

- Discharge ionization detector (DID), which uses a high-voltage electric discharge to produce ions.
- Dry electrolytic conductivity detector (DELCD), which uses an air phase and high temperature (Coulsen) to measure chlorinated compounds.
- Electron capture detector (ECD), which uses a radioactive beta particle (electron) source to measure the degree of electron capture. ECD are used for the detection of molecules containing electronegative/withdrawing elements and functional groups like halogens, carbonyl, nitriles, nitro groups, and organometallics. In this type of detector, either nitrogen or 5% methane in argon is used as the mobile phase carrier gas. The carrier gas passes between two electrodes placed at the end of the column, and adjacent to the anode (negative electrode) resides a radioactive foil such as 63Ni. The radioactive foil emits a beta particle (electrode) which collides with and ionizes the carrier gas to generate more ions resulting in a current. When analyte molecules with electronegative / withdrawing elements or functional groups electrons are captured which results in a decrease in current generating a detector response.
- Flame photometric detector (FPD), which uses a photomultiplier tube to detect spectral lines of the compounds as they are burned in a flame. Compounds eluting off the column are carried into a hydrogen fuelled flame which excites specific elements in the molecules, and the excited elements (P,S, Halogens, Some Metals) emit light of specific characteristic wavelengths. The emitted light is filtered and detected by a photomultiplier tube. In particular, phosphorus emission is around 510-536nm and sulphur emission is at 394nm.
- Atomic Emission Detector (AED), a sample eluting from a column enters a chamber which is energized by microwaves that induce a plasma. The plasma causes the analyte sample to decompose and certain elements generate an atomic emission spectra. The atomic emission spectra is defracted by a diffraction gradient and detected by a series of photomultiplier tubes.
- Hall electrolytic conductivity detector (ElCD)
- Helium ionization detector (HID)
- Nitrogen–phosphorus detector (NPD), a form a thermionic detector where nitrogen and phosphorus alter the work function on a specially coated bead and a resulting current is measured.
- Infrared detector (IRD)
- Mass spectrometer (MS) – also called (GC-MS) highly effective and sensitive, even in a small quantity of sample.
- Photo-ionization detector (PID)
- Pulsed discharge ionization detector (PDD)
- Thermionic ionization detector (TID)

Some gas chromatographs are connected to a mass spectrometer which acts as the detector. The combination is known as GC-MS. Some GC-MS are connected to an NMR spectrometer which acts as a backup detector. This combination is known as GC-MS-NMR. Some GC-MS-NMR are connected to an infrared spectrophotometer which acts as a backup detector. This combination is known as GC-MS-NMR-IR. It must, however, be stressed this is very rare as most analyses needed can be concluded via purely GC-MS.

METHODS

The **method** is the collection of conditions in which the GC operates for a given analysis. **Method development** is the process of determining what conditions are adequate and/or ideal for the analysis required.

Conditions which can be varied to accommodate a required analysis include inlet temperature, detector temperature, column temperature and temperature program, carrier gas and carrier gas flow rates, the column's stationary phase, diameter and length, inlet type and flow rates, sample size and injection technique. Depending on the detectors installed on the GC, there may be a number of detector conditions that can also be varied. Some GCs also include valves which can change the

route of sample and carrier flow. The timing of the opening and closing of these valves can be important to method development.

CARRIER GAS SELECTION AND FLOW RATES

Typical carrier gases include helium, nitrogen, argon, hydrogen and air. Which gas to use is usually determined by the detector being used, for example, a **discharge ionization detector** (DID) requires helium as the carrier gas. When analyzing gas samples, however, the carrier is sometimes selected based on the sample's matrix, for example, when analyzing a mixture in argon, an argon carrier is preferred, because the argon in the sample does not show up on the chromatogram. Safety and availability can also influence carrier selection, for example, hydrogen is flammable, and high-purity helium can be difficult to obtain in some areas of the world. As a result of helium becoming more scarce, hydrogen is often being substituted for helium as a carrier gas in several applications.

The purity of the carrier gas is also frequently determined by the detector, though the level of sensitivity needed can also play a significant role. Typically, purities of 99.995% or higher are used. The most common purity grades required by modern instruments for the majority of sensitivities are 5.0 grades, or 99.999% pure meaning that there is a total of 10ppm of impurities in the carrier gas that could affect the results. The highest purity grades in common use are 6.0 grades, but the need for detection at very low levels in some forensic and environmental applications has driven the need for carrier gases at 7.0 grade purity and these are available. The names for typical purities include "Zero Grade", "Ultra-High Purity (UHP) Grade", "4.5 Grade" and "5.0 Grade".

The carrier gas linear velocity affects the analysis in the same way that temperature does. The higher the linear velocity, the faster the analysis, but the lower the separation between analytes. Selecting the linear velocity is therefore the same compromise between the level of separation and length of analysis as selecting the column temperature. The linear velocity will be implemented by means of the carrier gas flow rate, with regards to the inner diameter of the column.

STATIONARY COMPOUND SELECTION

The polarity of the solute is crucial for the choice of stationary compound, which in an optimal case would have a similar polarity as the solute. Common stationary phases in open tubular columns are cyanopropylphenyl dimethyl polysiloxane, carbowax polyethyleneglycol, biscyanopropyl cyanopropylphenyl polysiloxane and diphenyl dimethyl polysiloxane.

INLET TYPES AND FLOW RATES

The choice of inlet type and injection technique depends on if the sample is in liquid, gas, adsorbed, or solid form, and on whether a solvent matrix is present that has to be vaporized. Dissolved samples can be introduced directly onto the column via a COC injector, if the conditions are well known; if a solvent matrix has to be vaporized and partially removed, a S/SL injector is used (most common injection technique); gaseous samples (e.g., air cylinders) are usually injected using a gas switching valve system; adsorbed samples (e.g., on adsorbent tubes) are introduced using either an external (on-line or off-line) desorption apparatus such as a purge-and-trap system, or are desorbed in the injector (SPME applications).

SAMPLE INJECTION

The real chromatographic analysis starts with the introduction of the sample onto the column. The development of capillary gas chromatography resulted in many practical problems with the injection technique. The technique of on-column injection, often used with packed columns, is usually not possible with capillary columns. The injection system in the capillary gas chromatograph should fulfil the following two requirements:

1) The amount injected should not overload the column.

2) The width of the injected plug should be small compared to the spreading due to the chromatographic process. Failure to comply with this requirement will reduce the separation capability of the column. As a general rule, the volume injected, V_{inj}, and the volume of the detector cell, V_{det}, should be about 1/10 of the volume occupied by the portion of sample containing the molecules of interest (analytes) when they exit the column.

The some general requirements which a good injection technique should fulfil are:

- It should be possible to obtain the column's optimum separation efficiency.
- It should allow accurate and reproducible injections of small amounts of representative samples.
- It should induce no change in sample composition. It should not exhibit discrimination based on differences in boiling point, polarity, concentration or thermal/catalytic stability.
- It should be applicable for trace analysis as well as for undiluted samples.

COLUMN SELECTION

The choice of column depends on the sample and the active measured. The main chemical attribute regarded when choosing a column is the polarity of the mixture, but functional groups can play a large part in column selection. The polarity of the sample must closely match the polarity of the column stationary phase to increase resolution and separation while reducing run time. The separation and run time also depends on the film thickness (of the stationary phase), the column diameter and the column length.

COLUMN TEMPERATURE AND TEMPERATURE PROGRAM

The columns in a GC are contained in an oven, the temperature of which is precisely controlled electronically. The "temperature of the column" – an analyst is technically referring to the temperature of the column oven. The distinction, however, is not important and will not subsequently be made.

The rate at which a sample passes through the column is directly proportional to the temperature of the column. The higher the column temperature, the faster the sample moves through the column. However, the faster a sample moves through the column, the less it interacts with the stationary phase, and the less the analytes are separated.

In general, the column temperature is selected to compromise between the length of the analysis and the level of separation.

A method which holds the column at the same temperature for the entire analysis is called "isothermal". Most methods, however, increase the column temperature during the analysis, the initial temperature, rate of temperature increase (the temperature "ramp") and final temperature is called the "**temperature program**".

A temperature program allows analytes that elute early in the analysis to separate adequately, while shortening the time it takes for late-eluting analytes to pass through the column.

QUALITATIVE ANALYSIS

Generally, chromatographic data is presented as a graph of detector response (y-axis) against retention time (x-axis), which is called a chromatogram. This provides a spectrum of peaks for a sample representing the analytes present in a sample eluting from the column at different times. Retention time can be used to identify analytes if the method conditions are constant. Also, the pattern of peaks will be constant for a sample under constant conditions and can identify complex mixtures of analytes. In most modern applications however the GC is connected to a mass spectrometer or similar detector that is capable of identifying the analytes represented by the peaks.

QUANTITATIVE ANALYSIS

The area under a peak is proportional to the amount of analyte present in the chromatogram. By calculating the area of the peak using the mathematical function of integration, the concentration of an analyte in the original sample can be determined. Concentration can be calculated using a calibration curve created by finding the response for a series of concentrations of analyte, or by determining the relative response factor of an analyte. The relative response factor is the expected ratio of an analyte to an internal standard (or external standard) and is calculated by finding the response of a known amount of analyte and a constant amount of internal standard (a chemical added to the sample at a constant concentration, with a distinct retention time to the analyte).

In most modern GC-MS systems, computer software is used to draw and integrate peaks, and match MS spectra to library spectra.

APPLICATION

In general, substances that vaporize below ca. 300 °C (and therefore are stable up to that temperature) can be measured quantitatively. The samples are also required to be salt-free; they should not contain ions. Very minute amounts of a substance can be measured, but it is often required that the sample must be measured in comparison to a sample containing the pure, suspected substance known as a reference standard.

Various temperature programs can be used to make the readings more meaningful; for example to differentiate between substances that behave similarly during the GC process.

Professionals working with GC analyze the content of a chemical product, for example in assuring the quality of products in the chemical industry; or measuring toxic substances in soil, air or water. GC is very accurate if used properly and can measure picomoles of a substance in a 1 ml liquid sample, or parts-per-billion concentrations in gaseous samples.

In a typical experiment, a packed column is used to separate the light gases, which are then detected with a TCD. The hydrocarbons are separated using a capillary column and detected with an FID. A complication with light gas analyses that include H_2 is that He, which is the most common and most sensitive inert carrier (sensitivity is proportional to molecular mass) has an almost identical thermal conductivity to hydrogen. For this reason, dual TCD instruments are used with a separate channel for hydrogen that uses nitrogen as a carrier are common. Argon is often used when analysing gas phase chemistry reactions such as F-T synthesis so that a single carrier gas can be used rather than two separate ones. The sensitivity is less, but this is a trade-off for simplicity in the gas supply.

PRACTICAL USES OF CHROMATOGRAPHY

Hazardous waste site characterization, forensic investigations, and land mine detection are scenarios where soils may be collected and analyzed for traces of nitroaromatic, nitramine and nitrate ester explosives. These termally labile analytes are traditionally determined by High-performance liquid chromatography (HPLC); however, commercially available deactivated injection port liners and wide-bore capillary columns have made routine analysis by gas chromatography (GC) possible. The electron-withdrawing nitro group common to each of these explosives makes the electron capture detector (ECD) suitable for determination of low concentrations of explosives in soil, water, and air. GC-ECD and HPLC-UV are methods usually use for detection of 2,4,6-trinitrotoluene (TNT), hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), 2,4-dinitrotoluene (2,4-DNT), 1,3-dinitrobenzene (1,3-DNB), 1,3,5-trinitrobenzene (1,3,5-TNB), and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX).[5]

LC system equipped with amperometric detection can be used for analysis of complex explosive mixtures that contain TNT and several other related compounds. Amperometric detection is better than UV detection for analyzing samples that contain UV-absorbing humic materials that are often

5 C.R. Browerbank, P.A. Smith, D.D. Fetterolf, and M.L. Lee, *J. Chromatogr.A,* 902 (2000) 413-419.

found in soils that have supported vegetation. LC with amperometric detection is able to detect explosive components in aqueous samples in ppb concentrations.[6]

Solvating gas chromatography (SGC), as a separation techniques, use for separation of nitroglycerine (NG) and other nitrogen-containing explosives including 2,6-DNT, 2,4-DNT, 2,4,6-TNT, and PETN. SGC utilizes packed capillary columns together with the solvating power of carbon dioxide mobile phase.

Chemical sensors for explosive detection have attracted increasing attention recently. Namely, the guiding principal is to rely on a large number of sensor elements, each of which can detect several different chemical (explosives). Usually, chemical sensors based on host-guest interactions are used. For example, polymer host films attach onto surface acoustic wave (SAW) transducer. These films are stable, uniform, and highly sensitive to organic vapours. The sensor sensitivity and selectivity can be greatly increased by incorporating molecular recognition reagents such as cyclodextrin into the polymer films. Sensor arrays can be chosen for identifying explosives from possible interferents. The sensors coated with functionalized cyclodextrin polymer films are capable of detecting DNT vapour at parts per billion levels. Introduction of electron-rich aromatics onto the up rim of the cyclodextrin host greatly increases the film sensitivity and selectivity for nitroaromatics.[7]

REFERENCES

1. Pavia, Donald L., Gary M. Lampman, George S. Kritz, Randall G. Engel (2006). *Introduction to Organic Laboratory Techniques (4th Ed.)*. Thomson Brooks/Cole. pp. 797–817. ISBN 978-0-495-28069-9.
2. "Gas Chromatography". Linde AG. http://hiq.linde-gas.com/international/web/lg/spg/like35lgspg.nsf/docbyalias/anal_gaschrom. Retrieved 11 March 2012.
3. "Gas Chromatography". ACRF. http://www.gas-chromatography.net/gas-chromatography.php. Retrieved on 11 March 2012.
4. Harris, Daniel C. (1999). "24. Gas Chromatography". *Quantitative chemical analysis* (Chapter) (Fifth ed.). W. H. Freeman and Company. pp. 675–712. ISBN 0-7167-2881-8.
5. Higson, S. (2004). Analytical Chemistry. OXFORD University Press ISBN 978-0-19-850289-0.
6. C.R. Browerbank, P.A. Smith, D.D. Fetterolf, and M.L. Lee, *J. Chromatogr. A,* 902 (2000) 413-419.
7. A. Hilmi, J.H.T. Luong, and A.L. Nguyen, *J. Chrom.* A 844 (1999) 97-110.
8. X. Yang, X.X.Du, J. Shi, and B. Swanson, *Talanta,* 54 (2001) 439-445.

6 A. Hilmi, J.H.T .Luong, and A.L. Nguyen, *J. Chrom.* A 844 (1999) 97-110.
7 X. Yang, X.X. Du, J. Shi, and B. Swanson, *Talanta,* 54 (2001) 439-445.

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ECONOMIC-FINANCIAL EXPERT EVIDENCE AS A FORM OF FORENSIC ACCOUNTING

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Abstract: The complexity of social-economic relations, the process of transition in which there are growing and more concerning forms of economic crime and the general crisis of legal system lead to an increase in the number of cases and their processing. In many situations the usual legal knowledge experience and expertise of authorities leading criminal proceedings are not sufficient for addressing specific issues in specific criminal cases, in other words for determining and evaluating the relevant facts, particularly those relating to offenses in the field of economic crime. For this reason, the economic and financial expertise as a form of forensic accounting and presentation of evidence in criminal proceedings is conducted whenever the assessment or evaluation of a relevant fact demands the expert knowledge in the field of economics, finance, and bookkeeping.

Like other scientific disciplines, accounting makes its contribution to forensics with its contemporary and practical knowledge and achievements expressed in the form of forensic accounting. Obviously, economical and financial expertise as a form of forensic accounting in criminal proceedings is particularly important, because without it, it is not possible to solve some of the issues that appear in the trial. Starting from this and from the fact that the expertise itself is one of the most common reasons for the long duration of the criminal proceedings, there is a need for an actualization of this issue.

At first glance, intricate pathways of abuse in accounting create an impression of labyrinth, but only at the first moment. The experience that we are about to present here concerns forensic accounting and will certainly serve the practice. It will provide more guidance and clarifications to a lawyer just because of the fact that all this is far away from all the legal doctrine and deals with a topic unknown to judges and prosecutors.

Keywords: expert testimony, forensic accounting, economic crime, bookkeeping.

INTRODUCTION

Among other things, the paper, entitled as it is, should help a lawyer, prosecutor, and especially a judge, to perceive bookkeeping, accounting, and economic-financial expertise clearly, as to them these are somewhat arid subject matters, and to enable them to identify suspicious items that can be legally qualified as a criminal action. Economic - financial expertise is of great importance in all proceedings before courts and in government agencies. Its purpose is determining facts, and without the facts one cannot properly apply the law, and consequently provide adequate legal protection.

In the new social and economic relations there is a tightening of the interests of citizens, as well as the interests of the state, which further results in a number of lawsuits and criminal cases in the field of economic crime before the state and judiciary organs. It may be noted that these legal proceedings and processes become more complex and require special knowledge and skill to resolve. Each of the statutory special cases of expertise is itself an especially broad subject to a complex, multidisciplinary analysis, which goes beyond the general topic of expertise in criminal proceedings. Expressed statement refers primarily to the economic-financial expertise.

Almost all forms of economic crime, especially tax evasion, money laundering, fraud, abuse of power including the criminal offenses with elements of corruption, contain falsification of official documents and fabricating false accounting records. There is no need to talk about the incidence of these phenomena in our country.

Forensic accounting is more thorough and deeper examination than the ordinary auditing because it is targeted at the detection of fraud and abuse, as well as the sanctioning of offenders by way of collecting evidence acceptable to the court. A forensic expert can be employed by

the court on permanent basis, but not necessarily. It is important that these experts can further improve. To perform these jobs, excellent knowledge of the accounting, auditing, economics, business statistics, and the knowledge of investigative methods are required.

The scams and the attempts to identify and sanction them are equally old. Seen from this angle forensic accounting is nothing new. However, what make the forensic accounting new are its complexity, and the interdisciplinary requirements. This is exactly what makes it a special profession of the XXI century, and not a faddism.

HISTORICAL ORIGINS OF ACCOUNTANCY THE IMPORTANCE AND ITS ABUSE

Recording business and trading enterprises and changes is an old activity. This conclusion arises from the numerous business records that are preserved to this day and age, and are from different times, even the oldest in history. In the Middle East, the emergence of banks corresponds to the period of approximately 3400 to 3200 years BC and relates to religious rituals and beliefs, so that the temples were the first founders of banks. The first bank in the form of a temple was built near the town Uruc (nowadays Varc) during the times of powerful Babylon civilization. In any case, there was a huge build-up of credit funds through a strange accumulation based on religious grounds. It is believed that the priests of the Red Temple of Uruc were the first lenders and loan sharks, too of agricultural products, mostly grains, and therefore, the first bankers of the world.

Archaeological findings from the earliest stages of the development of Egyptian civilization reveal the first written traces of many recordings done by managers of various government departments such as the "section for building the Nile Canal", "military expenditures", "royal house" and more. This kind of evidence was led in chronological order in a two-fold form, where all income and expenditure was noted, which is a genuine, though primitive bookkeeping. This chronological and continuous task inputting, as well as the comparison of input and output values, done by the first Egyptian bookkeepers, makes the content and essence of modern accounting of XXI century. Another civilization, different from all others entirely, also flourished in the shade of the Ands. It was the mighty Inca civilization, totally unknown to man until XVI century. Quipu was the only Inca instrument for calculating and writing. Its application was so versatile; it can almost be considered some form of alphabet. Quipu consists of a long, central string to which a large number of main strings are attached, from one to over a hundred, and the tinier and shorter cords are attached to these ones. This instrument was used for numerical notes, too. Some Quipu instruments are actual books by which the Incas found a way to preserve their history, as well as their laws, and their ways of bookkeeping.[1]

The first business books and accounting in its full meaning emerged in the Middle Ages. During XIII and XIV centuries in Italy, the bankers of the great Medici family, and Fuggera and Velzera families, who owned powerful and much branched factorias[2] kept the first books, and so did the wool merchants from Flanders.

Paccolli, a monk of the Order of St. Francis was the first to realize the concept that all business cases by their sense and actual content are classified in accounts, so that they may gather into one group, and thus by a suitable posting game the assets can be shown at any time. He did it in a big trade Emporium in Venice, in 1494. So the double-entry Italian bookkeeping was invented. The release of Schweicker's work in Nuremberg, in 1519, shows the velocity and far reach of the concept of double-entry bookkeeping.[3]

If we start from the basic assumption that accounting is the real picture and business language of each legal entity, then from that perspective, we can see the presence of illicit activities. In the modern business environment, especially now in times of financial crisis, when the slightest rumors of doing business under suspicious circumstances result in the fall of public

1 Quipu that are preserved today are from archeological sites. They were intensively burnt by the Conquistadores. The dynasty of Inca lasted for twelve generations. The founder of the dynasty is Manko Kapak.
2 Settlements of traders in oversee countries, especially the colonies with big storehouses for imported and exporting goods.
3 Dr. Ernest G. Jenni „Zloupotrebe u knjigovodstvu" Asee Books Novi Sad, 2007, p. 9.

confidence in the whole economic and financial system, suppressing economic crime is a real challenge. Economic crime is complex both in its meaning and by sophisticated conducting of criminal activities. Institutions dealing with economic and financial crime, such as the judiciary and the tax authorities often do not have sufficient capacity to cope in practice with sophisticated accounting and bookkeeping fraud, so there exists a constant need for their improvement of knowledge in this field.

Criminal action is an ambiguous term which is difficult to define and predict. Criminal actions include a number of irregularities and illegal acts characterized by intentional deception or misrepresentation of accounting items. Incriminating actions may include the following: manipulation, falsification or alteration of records or documents, misappropriation of funds, prevention of registering or neglect to register business events in records and business documents, filing fictitious business events and the like. In addition, the term "error" refers to unintentional mistakes in financial statements, such as calculation and administrative errors in auxiliary records and accounting data, oversight or misinterpretation of facts, misapplication of accounting rules and more.

Abuse and deception have always happened in accounting. They are followed by the financial collapse, and more recently this happens in the larger scale and with more serious consequences for us all. In order to eliminate abuses in bookkeeping and quickly find the traces of a committed error and examine them successfully one must primarily be privy to the motives which cause such deviations. Depending on the cause by which falsifying or concealing in the books is done, we can distinguish two large groups:

1) 1. The first group includes disloyal actions of employees causing damage to the holder of the ownership structure of the company;
2) 2. The second group includes irregularities having been made by the business owner to falsely present the actual state of affairs in the company.

Counterfeits of the second group, i.e. those that have been made in the interest of the business owner are different from the ones falling in the first group by motives, as well as by the manner of execution. A well-arranged and diligent bookkeeping is undoubtedly one of the most important elements of the security of business.

THE SIGNIFICANCE OF ECONOMIC AND FINANTIAL EXPERTISE THROUGH THEORY AND PRACTICE

Expertise is mentioned in virtually all legislation. The reason for ordering the expertise is not only the lack of specialized expert knowledge of the bodies dealing with the case but also because the very body of the procedure, in most cases it is the court of law, even when it has adequate expertise alone cannot discretionally appreciate the facts for which the identification and evaluation requires a certain degree, training or qualifications.

Procedural law stipulates material and formal conditions for the implementation of expertise, and the very process of expertise, depending on its type, is conducted according to the rules of the profession and specific skills. The material conditions for ordering an expertise stem from the need to obtain a finding or an opinion from the person or institution that has the necessary expert knowledge in order to establish or review some important facts, and the formal requirement is that the implementation of expertise is ordered by the designated organ in the form of a writ.

The legislator has divided expertise in criminal proceedings into those that are explicitly standardized in the law and all other regulated by the general provisions on expert opinion. According to the object of expertise, or by the kind of facts that are subject to expertise it is divided into:

– Expertise regarding the deprivation of life;
– Expertise regarding a personal injury;
– Expertise regarding mental condition;

– Expertise of ledgers; and
– Expertise of photos and video and audio recordings.

Theorists of criminal procedure law dispute over whether the expertise stipulated by procedural law is mandatory or optional. For each special case of forensic expertise the legislator determines the conditions for its ordering, the very procedure of the expertise and the direction and purpose of such expertise.

Economic and financial expertise is very complex and at the same time very delicate to the judge who must critically evaluate an expert opinion on the matter with which they are not very familiar in view of the fact that the expert evidence in question may relate to different branches of science and practice, and this requires expert knowledge that the court does not have, in this case of economics and accounting. This kind of expertise can be provided by physical and legal persons. Legal entities that may supply findings and give opinions in the capacity of expert are primarily specialized organizations established to make expertise, and that it is their predominant activity. Such an institution is the Institute for Expertise in Belgrade. State organs can also provide expertise on the facts falling within the area they were founded to deal with. Other organizations, especially scientific ones, such as the university, as well as institutions and associations of accountants and auditors have a special role in the process of expertise making.

In our country, only people who are citizens of Serbia can deal with economic and financial expert evidence and in proceedings before the courts only those who are registered in the court register of expert witnesses. Of course, experts must have the capacity to act, but also meet the other requirements that makes them worthy to do the job.

There exists a formulation in the Serbian judiciary practice by which it is determined whether a person or an organization is competent for expertise in economic and financial area. The term "economic-financial area" in the modern world is very wide hence more than ten specialties appear in economic studies today. Therefore, this term must be strictly defined in order to avoid errors and omissions that are come upon in many controversial situations in practice. The fact that someone is declared competent to provide expertise in economic and financial area, instigate situations in practice in which experts too easily involve with giving expert opinions on the cases falling in the areas that they are not professionally trained for.[4]

The expert is a person who has special expertise and skills to establish or review some important facts in the process. The specific requirements that individuals and legal entities must meet in order to become expert witnesses are stipulated by the provisions of the Law of court experts.[5]

The most important activity of the court when it comes to economic and financial expertise is the assessment of the findings and opinions presented by the expert witness, in other words, their testimony. The essence of this assessment is to determine in each case whether the expert evidence confirms or denies the existence of a disputed fact. In criminal proceedings, each piece of evidence is assessed individually and in conjunction with other evidence, bearing in mind that the assessment of the findings and opinions from a financial expert is somewhat more complex.[6]

With the Development of economics, finance, accounting, expand the possibilities of application of their achievements by expertise to determine disputed facts in criminal proceedings with regard to offenses in the field of economic crime, such as inadequate criteria for the assessment of expert's qualifications, inadequate collection and provision of materials, fails in the practical managing the expertise, uncritical attitude toward expert findings, and more.

The answer to the question as to what and how much significance the economic and financial expertise has is decidedly difficult to give with regard to the fact that this issue is debated from opposing starting positions that are quite far apart. They range from the viewpoint that the expertise

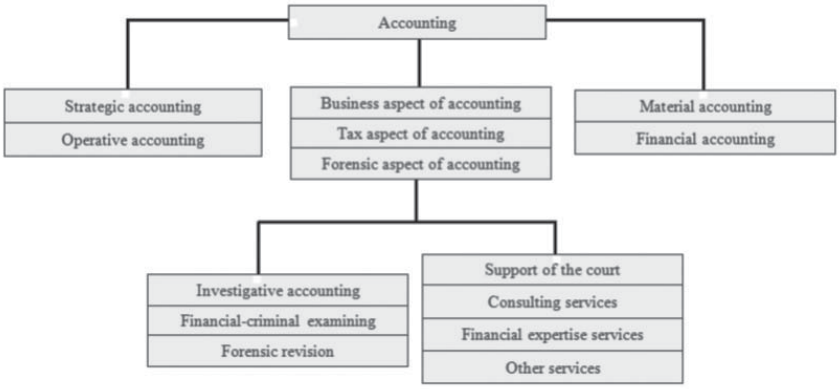
4 Dragomir Đorđević „Ekonomsko-finansijsko veštačenje u sudskim sporovima", collection of works, Belgrade, 2010, p.134.
5 The Republic of Serbia Official Gazette No. 44, June 30, 2010.
6 It happens in practice, that the parties, usually the defendant and his counsel independently obtain the report and expert opinion that, as a rule, is contrary to the findings and opinions of the experts designated by the authority of the procedure. Such findings and opinion are not valid in the proceedings; therefore, the courts in the first instance consider it to be only a form of complaint and objection to the basic findings and opinion.

is just one of the pieces of evidence, and not the most important, through the standpoint that the expert provides immediate assistance to the judge or the authority that manages the procedure to establish the facts, to the fact that there is an opinion that the expert evidence directly affects the decision itself. To a large extent the importance of experts and their expertise in the field of economics depends on the quality of findings, but the attitude of the judge conducting the proceedings and his assessment of the importance of expertise is predominant.[7]

INSTITUTIONAL FRAMEWORK OF FORENSIC ACCOUNTING IN SERBIA

Starting from the Constitution and a number of ratified international agreements, the Republic of Serbia is trying to define authorized bodies of the executive power which, in their struggle against financial destruction and economic crimes, apply forensic methods. In the new millennium, we cannot even imagine the completion of a criminal proceeding in the area of economic offenses in which a forensic expert does not show as a source of evidence, or a person who has specialized knowledge and skills necessary to establish or review some important facts. Achieving compliance with the rules of professional conduct and their actual use is possible with a new branch of bookkeeping and accounting activities: **forensic accounting**.

Table 1: Schematic presentation of the position of forensic accounting in accounting activities.



The term derives from the Latin adjective *forensis*, meaning forum. In ancient Rome, a forum, or square was the place of various commercial and government operations, including the venue. Forensic accounting is mentioned for the first time in Glasgow, Scotland,[8] in1824, and its application in practice is present especially over the last year. At first, the need appeared for forensic accountant services in banks, most recently primarily judiciary bodies and institutions for the prevention of economic crime.

Despite the general belief, forensic accountant is a profession the services of which have been clearly needed for more than a century, but only recently it has obtained a sound institutional framework. Associations of forensic accountants are established and the differentiation of the profession in relation to related occupations is taking place. Forensic accounting as a profession addresses the problems from the perspective of complex knowledge and skills of accounting, auditing, statistics, economics, legal system, information technology, and investigative skills. Forensic accounting is a set of research methods of financial transactions and business situations in order to determine a likely potential criminal activity.

7 Jadranka Ilić „Utvrđivanje odlučnih činjenica u upravnom postupku i u upravnom sporu – veštačenju" Belgrade, 2010.
8 Ramaswamy, 2007

Forensic accounting gets a new gratification and institutional framework with the fact that the Serbian Parliament adopts a law on court experts in June, 2010. With the endorsement of this law, the Law on conditions for performing the job of expert[9] that was in force for more than 25 years was terminated. Although it had long been subjected to harsh criticism it survived.

The forensic accountant who is an expert with excellent business-economic and socio-legal knowledge, who has all the characteristics: competence, education, reliability, cooperation, truthfulness and other virtues is the carrier of the task of forensic accounting. The role of expert witness in criminal proceedings is indispensable and makes a significant and sometimes decisive contribution to establishing the truth, and in order to reach that goal one of the key questions to which the subject of criminal proceedings, seeking professional help, must supply the answer is - who to choose for the expert.

Continuous professional improvement and institutional development and the completion of scientific capacity are essential for the application of forensic science in this specific area of crime. It can be concluded that the Republic of Serbia is on the road to European integration, a state that promises a good quality institutional framework and is an equal partner to the developed European countries when it comes to forensic accounting, both in theory and in practice.

FORENSIC ASPECT OF FACT ESTABLISHING AND COMPETENCE IN CASES OF ECONOMIC CRIME

Border area of law and economics has always been of interest to economists, primarily because of the belief that principle and logic of economic reasoning can be applied to other areas of life, and to the law. Interdisciplinary environment in this case does not occur only as a theoretical question of interweaving two social sciences, but as a practical matter related to the functioning of the economic and financial practice. The subject of this section is the forensic aspect of fact-establishing in cases of economic crime. Forensic science has recently developed in many directions, including the direction of forensic accounting. This is caused by a great damage to the economy arising from fraud and false financial reports. Therefore, the interest in business forensics and forensic accounting shoots up all over the world in recent years. The growing number of fraud, and the fact that the FBI recruited 600 agents in the capacity of forensic accountant and that the total number of this kind of specialists increased forty percent,[10] prove the fact that the topic of forensic accounting is critical.

Therefore, forensic accounting and the aspect of fact establishing in the field of economic destruction is a special accounting activity performed by a forensic accountant who is able to discover and evaluate the lost economic benefits, damages and liabilities caused by criminal and other illegal acts. Forensic evidence is collected so as to be acceptable to the court hearing the perpetrators. The way the court will react does not fall in the area of forensic accounting. It is because of this fact that forensic experts and their specialized knowledge become the link that completes and makes the fight against economic crime more efficient.

Forensic accounting is a discipline which finds its interest. It is this forensic discipline that should give answers in order to be able to identify fraud and accounting misuse, therefore, the interest in this area is very large. Forensic accounting encompasses not only classic accounting and classic fraud, but a wider area that deals with IT and IT fraud crime, i.e. how anyone can misuse the digital signature, electronic payment system, or forge a digital document.

Competence in the process of expertise is a very important problem of the judiciary in Serbia, especially when it comes to economic and financial area. When things get to this level, then the judiciary is in big trouble. In Serbia, it is often the case that great damage to the image and reputation of judiciary is caused by the incompetence and irresponsibility of experts.

The problem of competence is, therefore, in compliance with international regulations and standards that many of our forensic accountants are not familiar with and, therefore, do not follow. As legal representatives of neither plaintiff nor defendant are privy to these regulations and

9 SRS Official Gazette, No. 16, p. 87.

10 Today, the largest number of trained and experienced forensic accountants is in the U.S.A. The American Association of Business Crime Investigation Experts takes credit for that.

standards, and in criminal proceedings the lawyers of both parties also do not know about them, and neither do the courts, many of inadmissible evidence are accepted, which, at the end of the day, make the picture of the performance of our judiciary bodies look worse.

The existing university education, practical training programs and subsequent training in our country do not provide tax auditors, internal and external auditors and other inspection authorities with sufficient information and knowledge on this subject. Today's accountants must recognize the importance of lifelong learning especially in the field of forensics as an approach to their careers.

The role of forensic accounting is not to correct the social anomalies, but to investigate, in this case, all aspects of economic destruction and to identify those responsible. That does not mean that the social role of forensic accounting does not exist. Forensic work brings concrete results, and this prevents new offenders. That is its wider social role, but the systematic struggle against all forms of economic crime must be at the highest level.

FINAL REMARKS

The aim of this paper is to draw attention of all professionals involved to the need for applying economic and financial expertise as a form of forensic accounting, which is an unavoidable means of proving and a mechanism in the process of proving an economic criminal offence. The extreme significance of all aspects of economic financial expertise need not be particularly accented. This area needs to be additionally codified in a foreseeable future, regarding the fact that the new bill fails to resolve some dilemmas mentioned in the paper.

The role of financial expertise in the criminal proceedings is irreplaceable and gives a strong, sometimes even decisive, contribution to fact establishing. In order to achieve this goal, the areas and techniques of forensic accounting are presented. This discipline of forensic science offers the most important tools for preventing big social damage. Regarding our determination to move forward abreast with the world and the fact that we are not unfamiliar with accounting fraud and book doctoring, we need to improve on the development of forensic accounting.

This paper is far from any intention to promote distrust. Although at first glance the ways of misuse in bookkeeping are complicated and make impression of a labyrinth, it is only at the first moment. If the intentions are candid and when the proper form is applied the bookkeeping will be flawless.

One of the hypotheses is to propose a research project of wide coordinates that would be the subject of analysis of numerous experts from the field of economic and law science. The findings of such project will then be used by the holders of judiciary offices, and others who encounter the problem of having to gather evidence, establishing and assessing facts, and alike in their work.

REFERENCES

1. Dr. Ernest G. Jenni „Zloupotreba u knjigovodstvu", Asee books Novi Sad, 2007
2. Zbornik radova „Pravo i forenzika u kriminalistici" Kriminalistička policijska akademija Beograd 2010
3. Zvezdan Božinović „Forenzičko računovodstvo – Rafinirani tragači" Finansije Top 2010/2011 Beograd
4. Dr Aleksandar Petković „Forenzička revizija" Novi Sad. 2010
5. Albrecht, W. Steven., Albrecht, Chad: Fraud Ewamination&Prevention, Thomson-South-Western, Ohio, 2004
6. Muminović, S. „Forenzičko računovodstvo – potreba ili pomodarstvo?", Beograd, Institut za ekonomiku i finansije, Revizor, 2011
7. Bologna, G. Jack., Lindquist, J.Robert: „Fraud Auditing and Forensic Accounting", Second edition, John Wilex&Sons, New York, 1995
8. Dr Aleksandar Čudan, „Destrukcija finansijskih transakcija na tržištu", - Univerzitet u Novom Sadu, Ekonomski fakultet Subotica, 2006

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FINGERPRINT IMAGE ENHANCEMENT USING ROBUST ORIENTATION FIELD ESTIMATION

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Abstract: Efficient identifying of fingerprints is of vital importance for law enforcement agencies whose efforts to suppress criminal acts have lead to huge utilization of AFIS (Automatic Fingerprint Identification Systems). When dealing with both live scan and inked fingerprints, as well as the latent ones, the input image quality varies a lot. The quality of latent fingerprints is expected to be poor, with unclear ridge structures and even overlapping patterns. Simillarly, inked fingerprints often have smudge regions. Generally, the image quality depends on fingerprint acquisition device (equipment and technique) that is used, but there are also a number of factors (postnatal marks, occupational marks, creases, etc.) that contribute to a large number of spurious minutiae detected, decreasing the overall AFIS performance. This is a reason why some enhancement methods need to be applied before any further fingerprint image analysis and minutiae extraction. To enhance the images, most of the existing enhancement algorithms use filtering techniques that can be categorized as either isotropic or anisotropic according to the filter kernel. While isotropic filtering, although properly preserving features on the input images, can hardly improve the quality of the images, anisotropic filtering, on the other hand, is effective in removing the noise only when a reliable orientation is provided. Due to the fact that, in a local area of fingerprint image, ridges and valleys have well-defined frequency and orientation, majority of proposed enhancement techniques utilize this contextual information, making an orientation field estimation algorithm indispensable for enhancing poor quality fingerprint images. In this paper, we propose a robust multiscale orientation field estimation followed by an efficient enhancement method based on directional Log-Gabor filtering. Experimental results show that the proposed algorithm can successfully enhance even low quality fingerprint images obtained by ink method, outperforming standard, well known techniques including Gabor filtering.

Keywords: Fingerprint, biometrics, image enhancement, orientation field, pyramid decomposition, Log-Gabor filter

INTRODUCTION

The world of today knows of three techniques for automatic personal authentication: based on something one KNOWS (i.e. a password); one HAS (a token) and one IS (*biometrics*[1]). If there is an imperative for most reliable and accurate technique, then biometric recognition[2] is utilized as a necessary component of an ID management system, both in government and civil sectors. Among several human characteristics that can be used in biometric systems (face, retina, iris, voice, hand geometry, etc.), fingerprints are, due to their characteristics, one of the most researched, used and mature methods of authentication. They have been extensively used by forensic experts in criminal investigations for decades [2].

A fingerprint represents the image of the surface of the skin of a fingertip. Its structure consists of lines, called ridges, and interline spaces, called valleys, making an oriented texture pattern with well-defined frequency and orientation in a local neighborhood. The frequency depends on inter-ridge spacing, and orientation on flow pattern exhibited by the ridges. Regions of a fingerprint

1 As stated in [1]: 'The term *biometric recognition* is more appropriate than *biometrics*, because the latter has been historically used in the field of statistics to refer to the analysis of biological (particularly medical) data.'

2 Formally, biometric recognition can be defined as [1]: 'the science of establishing the identity of an individual based on the physical and/or behavioral characteristics of the person either in a fully automated or a semi-automated manner'.

where the ridge pattern makes it visually prominent are called *singularities*[3]. Anomalies revealed from the ridges (ridge endings, bifurcations, crossovers, short ridges, etc.) are known as local features of fingerprints called *minutiae*, which can be used both for manual or automatic fingerprint identification[4] since their number and position defines a fingerprint's individuality [2]. Typical structure and basic features of fingerprints are shown in Fig. 1.

Fig. 1. Basic features of fingerprints: ridge ending (), ridge bifurcation (O), core (×) and delta (Δ)

Automatic fingerprint identification systems (AFIS) have been extensively researched for almost 60 years. Using either fingerprint images taken by ink are digitalized, or different types of inkless scanners, a number of operations are applied in order to extract features (mostly minutiae) later used in the matching process. AFIS accuracy greatly depends on the reliability of the extracted features. It was shown that detected spurious minutia can be more harmful to reliable AFIS performance than a missed genuine one [3], making filtering of spurious minutia an imperative. However, the effectiveness of a feature extraction relies heavily on the quality of the input fingerprint images.

A number of factors (postnatal marks, occupational marks, creases, acquisition device, equipment and technique) contribute to fact that fingerprint images may not always have well-defined ridge structures, resulting in a high number of spurious minutiae detected. Therefore, enhancement is performed before feature extraction. When dealing with a particular fingerprint image, i.e. a latent one, we can apply any of the numberous digital techniques and filters, even combining and adjusting them for that particular case. But when we do not know what kind of fingerprint image is possible input, the enhancement method needs to be robust and applicable to all scenarios. That is the case of making a database of fingerprint templates for AFIS from an archive of cards of fingerprints taken by ink, when automatic the minutia extraction process is rarely intervened by a human expert. Majority of proposed enhancement techniques utilize contextual information (that in the local area of a fingerprint image, ridges and valleys have well-defined frequency and orientation). Several filters were proposed in the spatial [4, 5] and frequency [6-10] domains, but in both cases orientation field estimation algorithms are an indispensable step in filter design. Orientation field represent the ridge flow orientation on regularly spaced grids. It reveals intrinsic features of ridge topology and is fair to say that all subsequent processes in the fingerprint recognition systems (segmentation, enhancement, classification, spurious minutiae detection, matching) greatly depend on its accurate estimation [11].

The paper proposes a robust multiscale orientation field estimation, followed by an efficient enhancement method in Fourier domain based on directional Log-Gabor filtering. Experimental results show that the proposed algorithm can successfully enhance even low quality fingerprint images obtained by ink method, outperforming standard, well known techniques including Gabor filtering.

3 There are two types: *core* and *delta*, and they are very useful for determining fingerprint's class.
4 AFIS predominantly utilizes only two types (*ending* and *bifurcation*).

The rest of this paper is organized as follows. Section II presents methods for orientation field estimation, including the proposed one. Section III offers description of fingerprint enhancement and filters used for adaptive filtering in frequency domain. The proposed enhancement method, as well as the results of enhancement obtained from available database sets are presented in Section IV, and a conclusion is given in Section V.

ORIENTATION FIELD ESTIMATION

The ridge (or valley) orientation in two-dimensional space can be represented in two ways:

- as unit vector forming angle q with x-axis, which is called *direction* and lies in the range [0,2p).
- as nonoriented line, the angle q is called *orientation* and belongs to the range [0,p).

However, the literature dealing with fingerprint analysis, as well as this paper, use both terms "*direction*" and "*orientation*" as synonyms to denote the ridge line orientation.

An orientation image contains, in matrix form, information about local orientation in every pixel. Except for regions of singularities and noisy regions it is fair to say that orientation is almost uniform (changes very slowly) [2]. Different approaches for orientation estimation include: filter-bank based approaches (convolving techniques) [12, 13]; gradient-based approaches [14,15] and modeling techniques [16, 17]. The first mentioned are more resistant to noise than the gradient-based ones, and can be executed very quickly. A disadvantage of these methods is the fact that, since they rely on a number of fixed possible templates or filters (orientations are quantified mostly to only 8 directions), results may not be very accurate. For systems requiring a greater degree of accuracy gradient-based algorithms are employed. Their weakness is that they are quite sensitive to noise. In order to utilize model-based approaches first we need to know the locations and types of singularities in a ridge pattern in order to adjust the system parameters for orientation estimates. In such cases, to feed the training model as initial statistics the coarse orientation estimates are used, and they are obtained by any of first two methods, so only those will be briefly explained.

CONVOLVING TECHNIQUE

The first technique introduced for orientation estimation utilized convolution masks and directional filters. The local orientation of ridges in each pixel is chosen based on the principle of maximal gray level uniformity in the neighborhood of each pixel. Usually, the orientation is estimated in the neighborhood around the examined pixel in the center and in order to facilitate subsequent processing only a small number (typically 8) of possible orientations is allowed [2, 12, 13]. One typical mask is shown in Fig. 2. The pixel intensity values corresponding to eight possible directions (denoted $i=0,...,7$) are summed to give eight directional sums s_i. The formation of directional sums can be interpreted as the convolution of fingerprint image with eight masks, having all elements equal to zero except in positions denoted by i where the elements have value 1.

6		5		4		3		2
7		6	5	4	3	2		1
		7				1		
0		0		*C*		0		0
		1				7		
1		2	3	4	6	6		7
2		3		4		5		6

Fig. 2. The 9x9 mask to compute directional sums.

After the computation of eight directional sums, the maximal and minimal sums are determined as:

$$s_p = \min_{0 \le i \le 7} s_i, \quad s_q = \max_{0 \le i \le 7} s_i \tag{1}$$

The direction at a pixel is defined to be p if the center pixel is located on a ridge or q if the center pixel is located in a valley. Therefore, the direction at a pixel is defined as:

$$d = \begin{cases} p, & \text{if } (4C + s_p + s_q) > \frac{3}{8}\sum_{i=0}^{7} s_i \\ q, & \text{if } (4C + s_p + s_q) \le \frac{3}{8}\sum_{i=0}^{7} s_i \end{cases} \tag{2}$$

where C is the value of the central pixel.

In order to reduce extensive processing block-directional image is estimated where the average direction is assigned to the block as its dominant direction. In order to obtain correct results, in averaging procedure doubled angles are used to represent the directions and the average vector $v_a = (x_a\ y_a)$ is obtained, where x_a and y_a are the averages of cosine and sine components of all unit vectors belonging to that block. The average direction angle is easily found as $a = 0.5 \arctan(y_a / x_a)$. Also, as a measure of direction uniformity in a block, the modulus of the resultant vector $\sqrt{x_{av}^2 + y_{av}^2}$ can be used. If the modulus is closer to one, the uniformity of directions is better, and the result of averaging is more reliable.

This method of computing the orientation field is used widely because it is simple and fast. However, the estimated field is coarse due to the finite number of possible directions.

GRADIENT-BASED APPROACH

In fingerprint images, the gradient vector $[G_x(x,y)G_y(x,y)]^T$ will point in the direction from ridges towards valleys, as this will be the direction of maximum change in grayscale pixel values for a local area. Orientation of ridges in that area will be perpendicular to the average squared gradient $[\overline{G_{s,x}}\ \overline{G_{s,y}}]^T$ [2], which in a block specified by a window size W can be calculated as:

$$\begin{bmatrix} \overline{G_{s,x}} \\ \overline{G_{s,y}} \end{bmatrix} = \begin{bmatrix} \sum_W G_x^2 - G_y^2 \\ \sum_W 2G_xG_y \end{bmatrix}. \tag{3}$$

The conventional "average square-gradient method" divides the input fingerprint image into equal-sized blocks and average over each block independently. The direction of orientation field in a block is given by:

$$\Phi = \frac{1}{2}\tan^{-1}\left(\frac{\sum_W 2G_xG_y}{\sum_W G_x^2 - G_y^2}\right) + \frac{\pi}{2}, G_x, G_y \ne 0 \tag{4}$$

Additional smoothing (low pass filtering) must be applied on the orientation values in order to eliminate inconsistencies in noisy regions. Orientation image is converted to a continuous vector field and vector averaging with some smoothening kernel is performed. The result of gradient-based approach is shown in Fig. 3.

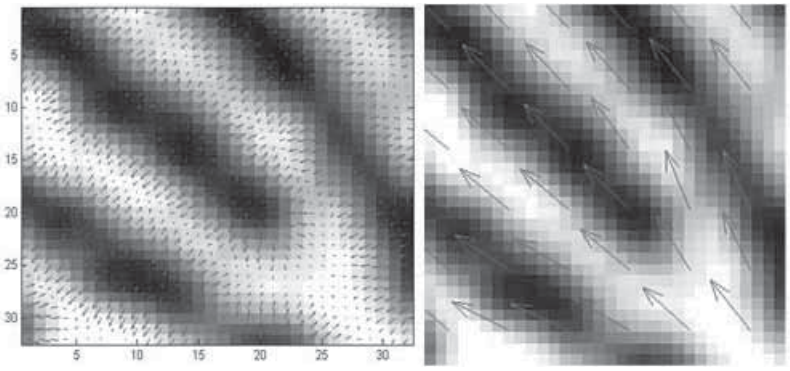


Fig. 3. Part of a fingerprint image with overlaid (a) gradient vectors, (b) directional image obtained by gradient method.

The same result can be obtained with *PCA*-based (*Principal Component Analysis*) gradient method where autocovariance matrix C of gradient vector is used [14]:

$$C = \begin{bmatrix} G_{xx} & G_{xy} \\ G_{xy} & G_{yy} \end{bmatrix} = \sum_{W} \begin{bmatrix} G_x^2 & G_x G_y \\ G_x G_y & G_y^2 \end{bmatrix} \tag{5}$$

The ridge-valley orientations are given by the shorter axis v_2, as direction of eigenvector that belongs to the smaller eigenvalue l_2 . Strenght *(Str)* of estimated orientation, defined as function of two eigenvalues is equivalent with coherence estimated in the traditional gradient method, measuring the gradient consistency in a local area in the fingerprint image.

$$Str = \frac{\lambda_1 - \lambda_2}{\lambda_1 + \lambda_2} = Coh = \frac{\sqrt{(G_{xx} - G_{yy})^2 + 4G_{xy}^2}}{G_{xx} + G_{yy}}. \tag{6}$$

MULTISCALE ORIENTATION ESTIMATIONS

The estimated orientation may contain some unreliable elements due to background noise and damaged ridges and valleys, caused by impression lack of certain image areas (scars, cuts…). Orientation smoothing (low-pass filtering as a form of scale reduction) can improve estimates of orientation field, however, it is crucial to determine the size of the averaging neighborhood [14]. It has to be large enough for effective noise reduction but also small enough to preserve localization. In another words, a single filter cannot be used for both the regions where singular points exist (high curvature-small filter) and regions where ridges are almost parallel (low curvature-large filter). A mechanism that can provide both noise robustness and feature localization is a multiscale model as an efficient way to combine the information from coarse to fine scale. For that purpose different approaches were proposed.

A consistency-based orientation smoothing method is performed from low to high resolution [15]. *Gaussian* filter of 3 different scales - s_1, s_2 and s_3 (for filtering image, block gradient and directional field respectively) was also introduced [18]. Inconsistent blocks are divided into 4 pieces the size of $3W/4 \times 3W/4$ (overlapping of 50%) until orientation with required consistency is achieved. Another approach is to utilize linear combination for scale propagation [19].

Different smoothing windows

The multiscale method, where filtering is adapted to the local curvature, was proven to be very effective [20, 21]. The *Gaussian* smoothing window of the size s = 5 gives good estimation around singular points (high curvature) but is unreliable in scar and creases regions. With s = 20 we have good estimation in those regions but localization around singular points is lost. In order to avoid this, a combination of different s values is used. The first orientation is estimated and then singular points are extracted. The orientation is then estimated with bigger s = 20, while in regions where singular points exist a lower scale s = 5 is used. Results of this approach applied on original grayscale fingerprint image available from [22], modified for test purposes with two scars in the upper left corner are given in Fig. 4. Note that for convenience, instead of presenting orientation in each pixel, we presented block-directional image overlaid at original image.

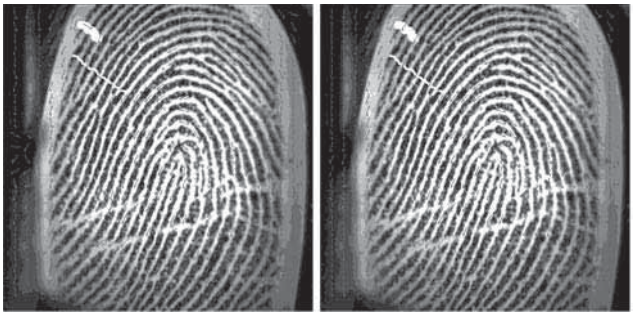


Fig. 4. Orientation image overlaid at input fingerprint image for (a) single scale (b) multiscale

Pyramid based

The multiscale method proposed here is based on research [19] and utilizes PCA. Results of applying PCA on a single scale [14] do not give good orientation estimates in noisy regions as shown in Fig. 5.

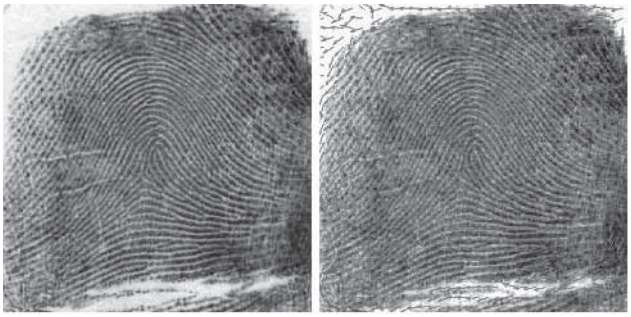


Fig 5. Original image with overlaid orientation image obtained with PCA method (single scale)

To improve estimation we employ the multiscale method. First, the image pyramid is defined as a collection of copies of an original image in which both sample density and resolution are decreased (Fig 6.).

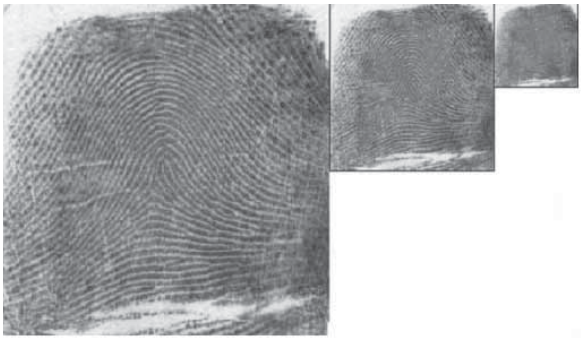


Fig. 6. An example of image pyramid for fingerprint image

The bottom layer of the pyramid is the original image. Since our goal is to depress noise effect, we choose to use *Gaussian pyramid* (not *Laplacian*). The multiscale approach is performed in three steps:

1) Build up the image pyramid:
- From the original image, repeat the low-pass filter/subsample steps to get the *Gaussian* image pyramid, then calculate gradient at each scale; or
- Calculate the gradients of the original image first and then build up a gradient pyramid. It gives similar results with less calculation and this is the pyramid we employ.

2) On each layer, the gradient field is divided into blocks in which local orientation is estimated using the PCA-based method.

3) Propagate down the estimation from low resolution (coarser layer) to high resolution. Combine the estimates from different scales to get a final orientation map.

One way to propagate estimations is linear combination [19] given as:

$$\hat{\theta}_n = k[n]\theta_{jm} + (1 - k[n])\theta_n \tag{7}$$

Where q_n represents an orientation map at the current level, q_{jm} on the parent level (lower resolution), $k[n]$ is weighting propagation factor, and q_n is the resulting estimation for the current level. A common way of choosing $k[n]$ is to use minimum variance criteria:

$$k[n] \approx \frac{\sigma_{jm}^2}{\sigma_n^2 + \sigma_{jm}^2}. \tag{8}$$

Where s_n^2 and s_m^2 are orientation variance on the current and parent levels respectively. The result of the proposed approach is given in Fig 7(a).

A problem with the multiscale approach is the blocking effect, which occurs in any block-based method. Since the multiscale method combines information from coarse scales, with larger blocks, this makes the blocking effect more obvious. A simple way to eliminate it, is using overlapped blocks. Results are shown in Fig 7(b) and are obviously better comparing to non-overlapping block approach.

Effectiveness of the multiscale over single scale approach is confirmed in Fig. 8 (portion of image (Fig.4)).

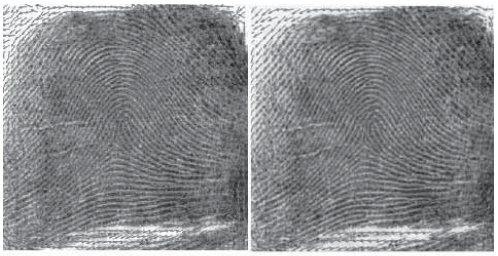


Fig 7. Multiscale orientation estimation with propagation factor $k[n]$ for (a) non-overlapping, (b) overlapping blocks

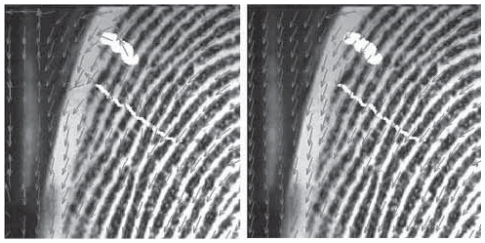


Fig 8. Portion of fingerprint image with overlaid orientation estimated for (a) single scale, (b) proposed multiscale approach

FINGERPRINT IMAGE ENHANCEMENT

Fingerprint image enhancement may be viewed as a process of improving the clarity of the ridge structure, where result is expected to be more suitable than the original for visual examination and automatic feature extraction. A variety of algorithms for image processing can be used in case of fingerprint images [2]. One group of algorithms, such as contrast manipulation and histogram equalization, are dealing with each pixel independently, while others are considering local neighborhood of each pixel. Typical algorithms from this class are filtering in spatial or frequency domain. Although noise content is reduced, enhancement process itself can also introduce false ridges, resulting in false or missing minutiae.

In case of fingerprint images it seems natural to perform enhancement with contextual (directional) filters whose parameters depend on the local ridge frequency and orientation, in which case the filtering process is called adaptive. Due to the regularity and continuity properties of the fingerprint image, occluded and corrupted regions can be recovered using the contextual information from the surrounding neighborhood. There were a lot of research in directional filtering in spatial and frequency domain including new subcategory where Gabor filters were utilized [2, 5, 7, 10].

Directional filtering in Fourier domain

Development of fast algorithms made possible for filtering to be done in Fourier domain where two different cases exists. First is when the filter is designed in spatial domain and filtering is performed in Fourier domain (instead of spatial convolution methods). Another approach is to design filter and perform filtering both in Fourier domain which was the case in our research. Anyway, chosen filter must satisfy the following criteria:

- Must be frequency and orientation selective;
- It has to pass spectral components corresponding to ridges, while attenuating noise components;

- DC and low frequencies have to be eliminated since they have no impact to the ridge frequency and orientation whatsoever;
- Band pass has to be properly selected since its upper boundary attenuate high frequency noise such as scars, and lower boundary attenuate low frequency noise such as smudges by ink. We must pay attention that narrow band pass do enhance the contrast, but can also cause unwanted ridge joining.

When filter is designed in frequency domain it is described with separable radial (H_r) and angular (H_a) components (Eq.(9)) which are tuned specifically to the distribution of orientation and frequencies in the local region of the fingerprint image. Radial component depends only on local ridge spacing (r=1/f) and the angular depends only on local ridge orientation (φ).

$$H(r,\phi) = H_r(r)H_a(\phi) \tag{9}$$

Defining and applying appropriate filter for each pixel is computationally very expensive, instead, a finite number of predefined filters are usually applied (regarding to finite number of discrete orientations, and fixed or average frequencies).

Band-pass Butterworth filter as radial component, and raised cosine filter as angular component proposed by Sherlock et al. [6] and adopted in [7, 8] are found to give very good results. On the other hand Gabor based filtering [5], as the most popular method in fingerprint enhancement, can also be performed in frequency domain. By simple adjustment of mutually independent parameters, Gabor filters can be configured for different shapes, orientations, different width of band pass and different central frequencies. Properly tuned, Gabor filter can filter an image, maintaining only regions of a given frequency and orientation and this has profound implications for research in fingerprint image analyses and enhancement [2]. Nevertheless, Gabor filters have some limitations (maximum bandwidth of a Gabor filter is limited to approximately one octave). To overcome that limitation and promote filtering in frequency domain, the Log-Gabor filter is proposed [9].

Log-Gabor functions have Gaussian transfer functions when viewed on the logarithmic frequency scale. 2D Log-Gabor filter is constructed in the frequency domain, with radial and angular component given by Eq.(10), where (r,φ) represents the polar coordinates, f_0 is the center frequency of the filter, φ_0 is the orientation angle of the filter, σ_r determines the scale bandwidth and σ_φ determines the angular bandwidth.

$$H_r(r) = \exp\left(-\frac{[\log(r/f_0)]^2}{2\sigma_r^2}\right)$$
$$H_a(\phi) = \exp\left(-\frac{(\phi-\phi_0)^2}{2\sigma_\phi^2}\right) \tag{10}$$

Comparing to Gabor filters, Log-Gabor filter can be constructed with arbitrary bandwidth which can be optimized to have minimal spatial extent and are allowed to reduce the over-representation of low frequencies, which is the reason why we choose them for our enhancement method.

PROPOSED ALGORITHM

Proposed algorithm for fingerprint enhancement in frequency domain is based on: local normalization, local orientation and frequency estimation and local filtering. The term 'local' means that input fingerprint image is previously partitioned into a number of B×B (16×16 in our experiment) square non-overlapping blocks in which consequently each of mentioned steps is performed. Except for the orientation estimation which was described in detail in previous section, other steps are to be briefly described.

Local normalization

First step is to normalize fingerprint image to a constant mean and variance. The main purpose of normalization is to have input images with similar characteristics, to remove the effects of sensor noise and also to reduce the variation in gray-level values along the ridges and valleys (without changing the ridge and valley structures) [2]. If normalization is performed on the entire image as suggested in [5], then it cannot compensate for the intensity variations in different parts of the image due to the elastic nature of the finger. Separate normalization of each individual block alleviates this problem. Local normalization of input fingerprint image is done as proposed in [8].

Local frequency estimation

The ridge frequency, as a slowly varying property, can be computed only once for each non-overlapping block of the image. We adopted method presented in [5], based on the projection sum taken along a line oriented orthogonal to the ridges which forms a sinusoidal signal, and the distance between any two peaks provides the inter-ridge distance K. The frequency f is computed as f= 1/K. Estimated local frequency and orientation corresponds to the center frequency f_0 and the orientation angle φ_0 of the Log-Gabor filter.

Local filtering

In order to implement filtering in frequency domain first the original fingerprint image is accordingly transformed to frequency domain. To reduce the computational cost, the windowed Fourier transform (2D WFT) is applied to each non-overlapping block of size B×B in order to extract corresponding frequency spectrum. To eliminate the block effects, the window size W should be larger than the block size B. This means that the neighboring windows will overlay each other with OV number of pixels. In order to meet the requirement for recovering the image from frequency domain, a raised cosine window is employed and described as in [7]:

$$W(x,y)=\begin{cases}1 & if\ (|x|,|y|)<B/2\\ \frac{1}{2}\left(1+\cos\left(\frac{\pi(x-B/2)}{OV}\right)\right) & otherwise\end{cases}$$
$$\text{where } (x,y)\in\left[-\frac{W}{2},\frac{W}{2}\right] \tag{11}$$

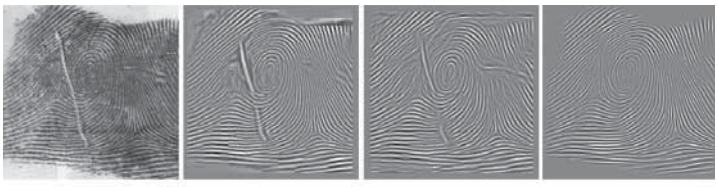
Window size W×W is set to 32×32 (chosen as compromise between performance and complexity). By moving the location of the window, the frequency spectrum corresponding to each block is obtained. Then the power spectrum is estimated, raised to a power α (0.5 was used) and multiplied by the spectrum elements ($F_1=F\bullet|F|^{\alpha}$). This has the effect of amplifying the dominant frequencies in the block, which, presumably, are those corresponding to the ridges, thereby increasing the ratio of ridge information to non-ridge noise and adapting to variations in ridge frequency from one block to the next. Then, each spectrum is filtered by a Log-Gabor filter tuned to the orientation and frequency of the corresponding block ($E=F_1\bullet H_r\bullet H_a$). Obviously, the filter should be constructed with the same size of the spectrum. Finally, the inverse Fourier transform of the filtered spectrums is computed ($B_{enh}=IFT(E)$), and its real part becomes the enhanced block. Enhanced image is obtained by composing those enhanced blocks.

Experimental results

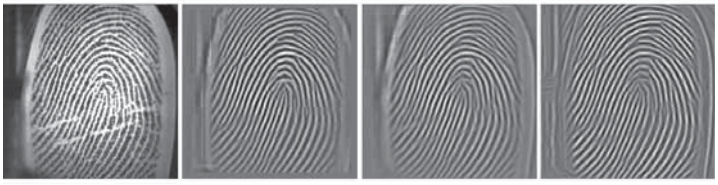
Our primary goal was to see if proposed enhancement algorithm is suitable to be implemented in the process of creating AFIS template database from ten-print fingerprint card archives obtained by ink. For that purpose we used our own fingerprint database containing 100 fingerprint images (10 cards) taken by ink and then digitized with optical scanner using spatial resolution of 500 dpi and amplitude resolution of 8 bit per pixel [10]. Nevertheless, we also tested proposed algorithm on

samples taken from [22] in order to show its effectiveness for wide range of cases. Testing software was implemented using MATLAB® development environment (The Mathworks Inc., USA).

The result of proposed image enhancement method for test image from our database is shown in Fig. 9(a). We choose image containing scars (one quite wide) and smudgy regions in order to emphasize the enhancement results. For comparison, Fig. 9 also shows two other images, enhanced by means of STFT method [7] and using Gabor filter enhancement method [5]. The example demonstrates that proposed algorithm has preferable performance. Similar results were obtained for our entire database set with obviously enhanced ridge structure. In cases of images of relatively good quality all tested algorithms provide similar (comparable) results, as shown in Fig. 9(b).



(a) Original image from our database [10]



(b) Original image taken from [22]

Fig. 9. Examples of enhanced images. From left to right: original image, image enhanced using STFT method, image enhanced using Gabor filter and the proposed enhanced image

CONCLUSIONS

Fingerprint enhancement is a common and critical step in AFIS, aimed at increasing the contrast between the ridge and valley and removing noise in the image. The directional filtering technique, a general image-processing operation, is widely used for this purpose. The directional filter should be tuned to contextual information (orientation and frequency) previously obtained from the fingerprint image. Although there are different methods for fingerprint image orientation estimation, improvements are more than appreciated. We described a robust method for orientation field estimation at multiple scales, whose efficiency was tested and proved on a real fingerprint database. Accurate orientation obtained in the proposed way was used in filter design, where filtering itself was performed in Fourier domain. The proposed enhancement method is based first on amplifying the dominant frequencies by a factor of raised power spectrum (noise reduction) and then by appropriate filtering using Log-Gabor filter (directional enhancement), and was found to produce preferable results for the fingerprints considered in this study. It was shown that filtering techniques work well in a broad range of cases, and are suitable for the quantity of fingerprints to be enhanced. As a result of the enhancement process, more reliable feature extraction is obtained, less spurious minutiae are extracted, improving the overall AFIS accuracy. Our future research will focus on testing the algorithm on a larger fingerprint database (including public) in order to estimate more relevant statistical parameters for its performance. Some new methods for spurious minutiae filtering will also be considered.

ACKNOWLEDGEMENTS

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REFERENCES

1. Jain A, Ross A, Nandakumar K. (2011). *Introduction to Biometrics*. Springer New York.
2. Maltoni D, Maio D, Jain A & Prabhakar S. (2003). *Handbook of Fingerprint Recognition*. Springer New York.
3. Pankanti S, Prabhakar S & Jain A. (2002). On the individuality of fingerprints. *IEEE TPAMI*, 24(8), 1010–1025.
4. O'Gorman L & Nickerson JV. (1989). An approach to fingerprint filter design. *Pattern Recognition*, 22(1), 29–38.
5. Hong L, Wan Y & Jain AK. (1998). Fingerprint image enhancement: Algorithm and performance evaluation. *IEEE TPAMI*, 20(8), 777–789.
6. Sherlock BG, Monro DM & Millard K. (1994). Fingerprint enhancement by directional Fourier filtering. *Visual Image Signal Process*., 141, 87–94.
7. Chikkerur S, Cartwright AN & Govindaraju V. (2007). Fingerprint enhancement using STFT analysis. *Pattern Recognition*, 40(1), 198–211.
8. Raicevic A & Popovic B. (2009). An Effective and Robust Fingerprint Enhancement by Adaptive Filtering in Frequency Domain. *Facta Universitatis Series: Electronics and Energetics*, 22(1), 91–104.
9. Wang W, Li JW, Huang FF & Feng HL. (2008). Design and implementation of Log-Gabor filter in fingerprint image enhancement. *Pattern Recognition Letters*, 29, 301–308.
10. Popovic B, Bandjur M & Raicevic A. (2010). Robust enhancement of fingerprint images obtained by ink method. *Electronic Letters*, 46(20), 1379–1380.
11. Popovic B, Bandjur M, Raičević A & Ranđelović D. (2012). Different methods for fingerprint image orientation estimation. *In proc. of 20th TELFOR'12*, 20-2 Nov. 2012, Belgrade, Serbia, 662–665.
12. Popović M & Popović B. (1997). Computer classification of fingerprints. *NBP*, 2(2), 107–120.
13. Candela GT, Grother PJ, Watson CI, Wilkinson RA & Wilson CL. (1995). *PCASYS – a pattern-level classification automation system for fingerprints*. National Institute of Standards and Technology, NISTIR 5647.
14. Bazen AM & Gerez SH. (2002). Systematic methods for the computation of the direction fields and singular points of fingerprints. *IEEE TPAMI*, 24(7), 905–919.
15. Mei Y, Sun H & Xia D. (2009). A gradient-based combined method for the computation of fingerprint's orientation field. *Image and Vision Computing*, 27(8), 1169–1177.
16. Zhou J & Gu J. (2004). A model-based method for the computation of fingerprints orientation field. *IEEE Transactions on Image Processing*, 13(6), 821–835.
17. Huckemann S, Hotz T & Munk A. (2008). Global models for the orientation field of fingerprints: an approach based on quadratic differentials. *IEEE TPAMI*, 30(9), 1507–1519.
18. Jin C & Kim H. (2010). Pixel-level singular point detection from multi-scale Gaussian filtered orientation field. *Pattern Recognition*, 43(11), 3879–3890.
19. Feng XG & Milanfar P. (2002). Multiscale principal components analysis for image local orientation estimation. *In the 36th Asilomar Conference on Signals, Systems and Computers*, 1, 478-482.
20. Bazen AM, Bouman NJ, Veldhuis RNJ. (2004). A multi-scale approach to directional field estimation. *In Proc. of 15th Annual Workshop on Circuits, Systems and Signal Processing, (ProRISC)*, Veldhoven Netherlands, 215–218.
21. Popovic B, Maskovic Lj & Bandjur M. (2007). Spurious Fingerprint Minutiae Detection Based on Multiscale Directional Information. *Electronics and Electrical Engineering*, 7(79), 23–28.
22. Biometric System Lab., University of Bologna, Cesena Italy, www.csr.unibo.it/research/biolab/

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THE ROLE OF THE FORENSIC ENTOMOLOGIST AND THE CORONER IN THE INVESTIGATION OF CRIMINAL OFFENSES

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Abstract: Forensic entomology has been used for a long time in the investigation and clarification of criminal act. Although commonly used in the study of death, it is also used for other purposes depending on the needs and the direction in which the range of research and clarification of a particular case moves. An adequate death investigation requires joint efforts and cooperation of experts in various areas and specialists of forensic law enforcement, professional forensic pathologists, anthropologists, entomologists and medical and non-medical experts. These experts have an important role in every death investigation.

A forensic pathologist is authorized by law to take the corpse away from the crime scene, analyze the extent of injuries and perform the autopsy. By doing the autopsy, he or she determines how, when and why the death has occurred, under what circumstances, suspicious or unexplained, the cause of death, and explains the reasons and answers the questions.

In a survey of death forensic entomology is used to determine the elapsed time between the occurrence of death, to determine whether the body were moved from one place to another, whether it be with a dead body subsequently manipulated, to locate the dead body wounds, detect the presence of drugs or poisons developments in the organs of the victim.

The forensic entomologist in total research can give responses on certain essential elements to solve complex criminal cases, and sometimes the only means by which they can identify and clarify important facts related to the specific offence, and therefore can play a crucial role in the detection of offender.

Also, a forensic entomologist in the total research can provide invaluable evidence to prove the death in which the remains were colonized by the insects. His task is to identify the insects that have colonized the body and to analyze entomological evidence.

Specific knowledge of the forensic experts and experts in forensic entomology in the implementation of the first contact from the scene, to the final stage of testing and interpretation of entomological traces in strictly controlled laboratory conditions.

This paper focuses on the ill-defined conditions that could arise when forensic pathologists and entomologists are uncertain about the procedures which they must comply with not understanding the value of objective evidence or fail to assess them.

Keywords: Forensic entomology, forensic entomologist, forensic pathologist, insects, entomological evidence, date of death, place of criminal

INTRODUCTION

Forensic entomology is the world s long been applied in the investigation and detection of crime. It is used to determine the elapsed time between the occurrence of death, to determine whether the body were moved from one place to another, determining whether a dead body subsequently manipulated, revealing the presence of drugs, poisons or drugs in the bodies of the victims.[11].

Bat the research and discovery of deaths is not the only area in which the priorities of forensic entomology. It has found wide application in cases of neglect and abuse of humans or animals investigating crimes against the environment, and in other cases. Forensic entomology is divided into; urban entomology, stored products entomology, and medical legal entomology.

1 Meek, C.L. Andrews , C.S. Standard techniques and procedures at the death scene in: Catts, E.P. Haskell.N.H. Entomology and Death , A Procedural Guide Print Shop, Clenson, SC, 1990, PP.72-81

Urban entomology deals with insects and related animals that adversely affect the houses, buildings and other structures. Their adverse impact is reflected in the from of insects infestation in houses gardens farms. Studies in the field of forensic entomology, urban, also have potential to answer questions about the applicability of certain types of pesticides, due to their possible harmful effects on human health.

Entomology deals with stored products insects that pollute the different types of stored food this. This branch of entomology answer the question whether the impugned product was infected insects in storage, ie. put on the market before or after and whether there is a basic for filing a claim against a third party. The importance of this forensic entomology is the fact that a large number of U.S companies that manufacture food has whole teams of forensic entomologists to help them avoid such litigation. This branch of forensic entomology deals with the prevention and exterminations of the most common insects that attack the food supply in the household[2]

Medical-legal entomology deals with the insects that feed on dead bodies (corpses) and dead animals on them or their eggs. This branch of forensic entomology answers to many questions related to how much time has elapsed since the occurrence of death to finding a dead body (postmortem interval), where exactly in death, which is the cause of sudden death that there was an abuse of insects, whether cause of death was poisoning by poison, drug or narcotic drug, based on the toxicological analysis of tissue samples collected from the digestive systems of insects that fed on the dead body. Based of the analysis of DNA obtained from tissues collected from the digestive systems of insects that fed dead body. Forensic entomology can be applied in a variety of research areas of crime, although usually applied in the study of death it is also used for other purposes, depending in your needs an the direction in which research in moving.

In a survey of deaths greatest contribution of forensic entomologists in the research and fact-finding, reflected in the determination of time since the occurrence of death to the discovery of the corpse. In the conventional to determine the time used by a variety of medical settings, but when the moment of death lapse of more than seventy-two hours, it is the most reliable and the most frequent means by which we can determine the time elapsed since the occurrence of death.[33]

Sam estimate of the time interval within which the death occurred is of great importance, for example: limiting the number of suspects. Also if the victims identity is unknown, it is this time interval may help in limiting the number of potential victims. At the same time it does not define the exact moment, but the shortest and longest time that has elapsed since the occurrence of death to the invention of a corpse.

Two methods can determine the time elapsed since the occurrence of death. One is based on the life cycles of various species of insects, and the other in a predictable sequence of successive colonization of the corpse. Successive colonization of a corpse is directly related to the natural changes that occur after death, chemical substances that occur as a result of decay, insects indicate that their other source of food available.

The first step in determining the elapsed time between the occurrence of death, the discovery of the corpse is the collection and processing of all types of insects caught up in it. If you stay long enough corpse at the murder scene, and if conditions were favorable insect will colonize it (nostrils, corners of the eyes ears). In the case of decomposition of the bodies were gone, it may happen that the forensic pathologist overlooked in the soft tissue wound especially if it is not deep enough to damage the bone or. cartilage[44]. In such cases, a forensic entomologist can be useful, since in the early stages of the flies food soft tissue female flies are genetically programmed to seek out moist and soft tissue (eyes, mouth, open wounds).

Although the task of forensic entomologist did not establish the existence of wounds on the first spot and alert the forensic pathologists irregular or atypical patterns of colonization, which may be an indication that in this area there could be some kind of early. Insects that feed on dead tissues of the body takes up in has digestive any substances that are found in these tissues. Therefore if the

2 Leclerg, M. Entomological Parasitology the relations between Entomology and the Medical Sciences, Pergamon Press Oxford, 1969, pp.128-148

3 Ernst, M.F.,Caplan,Y. H. the death scene, in: Caplan, Y. H.,Frank, R. S. Medicolegal Death Investigation, The Forensic Sciences, Colorado Springs,1999.pp 7-17.

4 Altamura,B. M.,Introna, F. A new possibility of applying the entomological Method of forensic medicine age determination og postmortem mutilation. Med.Leg. Quad Cam 4 1982 127-130

victim used drugs, I enjoyed drugs and might have been poisoned, can be obtained by analyzing the collected tissues from the digestive systems of insects that have fed on dead body tissue. Forensic entomologist at the scene visual view recorded the approximate number of different types of insects caught up in and around the corpse noticed parts where the greatest number of insects, the exact position of remains, collect data on weather temperature and humidity, temperature of the country, temperatures corpse. Entomologist collects samples from specific bodies, around the body before its removal in diameter and six feet, and below the corpse after its removal and transfer to the autopsy room.

AT THE DEATH SCENE AND AT THE AUTOPSY

The death scene is usually the focal point of any criminal investigation. A death scene properly processed can yield information useful to reconstruct events and circumstances, link a suspect to the victim or scene, establish the credibility of the statements made to investigators by witnesses.

In a death investigation, it would be extremely useful to determine if carrion-fly larvae have been feeding on human tissue since diptera larvae can be discovered in the absence of human remains at a location where the body is suspected to have been. The presence of live maggots in the absence of a dead body at a location is almost certain evidence that some kind of corpse has been removed from the scene[55].

Knowledge of the life cycles of insects may help determine the elapsed time between the occurrence of death, the most common examples are flies zujar. Flies zujar grow to adutt in a predictable sequence from egg through three stages of larvae and pupae stage two. In the first fev days zujar flies are the only reliable indicator basis of which it can be determined that time. During this period other insects colonized body but time will do that cannot be predicted. Zujar flies develop to adults of the egg through three stages larvae and a chrysalis stage. Pace of development depends on the type of flies and the ambient temperature zujar egg flies are up to two millimeters and the first eight hours after laying eggs not seen any signs of development, after which time the egg sac larvae are visible. When female flies lay eggs in them in optimal conditions within 24 hours, the larvae hatch the first stage, they are very sensitive and susceptible to drying out, not yet developed the oral organs eat only soft foods. It is for this reason the wounds and body cavities in dead telt ideal place for the development of the larvae. After a brief period of the first stage larvae to mouth (discard outer jacket) and become the second larval stage, have a pretty good organs that the liquid food is not necessary for their survival. After some time on the new surface feeding larvae mouth to the second stage and third stage larvae become. They gather in large masses within which generates high temperatures. After a period of intensive feeding larval stages of the third stage of investing in do not eat a food source in the search for a suitable location for pupae.

This is from the standpoint of forensic entomology is important because in the collection of material to search for expertise and the wider environment around the dead body. Third stage larvae can be found on the clothes, the hair, but also on the ground a few feet away from the body. Once you find a place to pupae the larvae do not reject the outer sleeve, but it is influenced by a number of substances secreted by the larva hardens, and a dark shape in the barrel in which the larva lies. At this stage, the immature larval tissues are completely separate, and so from the decomposed tissues build organs of adult insect. After completing the transformation of adult insects exposed pupae, which remains empty, a sign that the life cycle is completed. Empty cocoons indicates that from the moment of death passed about 20 days. Flies just emerging from pupae in no way like the adult fly zujar-crumpled wings are thin and weak, no distinctive metallic blue or greenish glow, gray in color and irregularly shaped heads. In this early stage of young flies cannot sly and is often hidden until dry and the ability to fly. Forensic importance of young flies is that they prove that a life cycle completed. Once the bride and dry flies start flying there is no way to reliably determine enough to have her fed and developed on the victims body, area though she was raised with him during the forensic processing.

5 Nuorteva, P. Sarcosaprofagus insects as forensic indicators, tedeshi, C.G. Eckert, L.G. Forensic Medicine a Study of Trauma and Environmenatal, Hazards, Vol. 2 Sanders, Philadelphia 1977.pp.1072-1095.

Therefore, during the length of time which has elapsed since the occurrence of death to finding a dead body on the basis of the life cycle of flies zujar need to collect many details. The forensic entomologist must occurrence identify the type of files whose larvae zujar found on the victims body, because the larvae develop different types at different speeds. The identification is performed on the basis of morphological characteristics. These characteristics are expressed in adult flies more than in larvae but the larvae of the different organs of the ear in recent years and analysis of DNA. This method is especially important when you are old or damaged samples, or the first stage larvae of which are hard to spot differences.

It is important to know the various stages of the life cycle of flies come in time zujar forensic processing the scene and collecting samples. Larvae which have reached the highest stage of development are the oldest, longest mean that remained on the victim When you find the clues that were concluded in the development stage you should immediately look for traces of the next stage of development. Example: if you have found the dead body of the third stage larvae that feed yet, so we should look for the third-stage without food. Only if you do not find such a higher stage of the larvae forensics can conclude that the developmental stage has collected the oldest, and relevant expertise. Since the development of insects depends on the temperature of invaluable importance to the collection of quality data on the temperature at the scene, to determine the age of the oldest developmental stages of insects collected forensic entomologists is one who knows the fast development of different types of insects at different temperatures[66].

Successive colonization of dead bodies is closely associated with the natural changes that occur after death. Chemical processes are the result of decomposition indicate that insects are served by a new source of food. With the advancement of the process of decomposition created and related a new foundation for nutrition which al tracts other insect species and thus come up with new colonization. The first step determining the elapsed time between the occurrence of death to the discovery of the corpse is the collection and processing of all types of insects caught up in it.

The order in which the insects to colonize a dead body depends on many factors such as: meteorological conditions, microclimate, exposure to sunlight and condition of dead bodies. Apart from insects collected forensic entomologist requires traces of activities and types of insects, whose members are not found on a body.

Traces of their activities indicate that a dead body is no longer a source of food and the type of insects that they had left. Means that the time interval within which this species found on the body passed. A forensic entomologists can provide valid conclusions upon the time of death only after taking into account the order in which different types of insects colonize a dead body.

Example: duration of chose decomposition . In the first stage of decomposition (**autolysis)** of fresh body types come necrophagous flies Calliphora Vicini or Farmia Terroenove which usually occurs in early spring. In the second stage of decomposition **(putrephacio**) body swelling of the gases that build up inside the body and the intense smell (stink),attracts more flies predators are usually (Staphilonidacae) which feed on eggs and larvae of flies. In the third phase (**fermentation)** further decomposition of the body resulting acid specific smell et. ol. butiric acids the body come Nicrophorus Humator beetles, and koprofagi Hyster Cadaverinus (Histeridae), and flies from Hydrotaea Capensis (Muscidae). The fourth stage of decomposition of the body remains the skin cartilage, bone and little meat. At this stage, the number drops down flies, beetles remain only. In the last final stage of decomposition of the body remains only sporadic bugs[77].

Depending on weather conditions, insects will colonize faster or slower dead body. At first, the only sign of colonizing the victims body, which flies lay their eggs in the open wounds comers of the eyes, mouth nose and around the genitals. By moving bodies from place to place at the same time killing the perpetrator moves and insects that colonized it, as an experienced forensic scientist entomologist rarely miss. It often happens that a dead body was in an advanced stage of decomposition and it happens that a forensic pathologist overlooked early in the soft tissue especially if it is not enough to damage the bone or cartilage. In this case, forensic entomologists help is great benefit. The larvae of flies in the early stages of the soft tissues of food exclusively, female flies are genetically

6 Benecke, M. Six forensic entomology cases description and commentary Forensic Sci. 43 1998. 797-805.1013.
7 Anderson, G.S. The use of insects to determine time of decapitation a case-study from British Columbia, Forensic Sci.42 1997 947-950.

programmed to seek out moist and soft tissue. Although the task of forensic entomologists did not establish early he will be the first to spot and warm the improrer forensic pathologist and quicky colonization which may be an indication that in this area there could be some kind of early. The task of the forensic pathologist to verify the indications and in the best possible way[88].

Insects that feed on dead tissues of the body to bring your digestive system any substances that are found in these tissues. In the victim used drugs, was a beneficial owner of narcotic drugs or being poisoned the presence of these substances in the tissues of insects that feed can affect their development. Poisons and other substances in the bodies of flies zujar are related in the early developmental stages. In cases where the victims body was to decomposed that the normal toxicological analyzes cannot get valid results. The answers to these questions can be obtained by analyzing the tissue collected from the digestive tract of insects, that fed tissues of dead bodies[99].

Forensic entomology can be applied for the analysis of traces of blood. Sometimes the very activity of insects at the scene may affect the results of the analysis of trace levels (blood-sparter analysis).

Traces of blood spot in unusual places can fool inexperienced forensic scientists who have not seen such evidence arising from traces of insect. In a similar way, forensics can be confusing traces of birds that moved through pools of blood and thus can not interfere with the original look o traces of blood. Flies feed on blood and feces so that traces of blood found in areas that are for from the main source of blood, which further confused because some traces resulting from insect activity due. It is a forensic entomologist can be helpful in cases of finding traces of blood that are unusual and difficult to explain.

The larvae of flies can get into open wound on the living body in two diametrically opposed ways. The first is deliberately placing larvae in open wounds for medical reasons. The most zujar flies feeding on dead tissue and larvae of flies doctors used to clean wounds by removing dead tissue larvae step by step, while not damaging the living tissue[1010]. Another way of studying the forensic entomology, related to abuse and neglect. The larvae feed on dead organic substance that can be found in living organisms (Humans and animals in the from of not heal shaped wounds, decubitus, efc. gangrenous tissue. Insects do not distinguish whether it is a dead tissue in a living or dead body, and the flies lay their eggs on live animals or people who cannot defend themselves from can defend. The presence of the larvae of flies on a living person remotely suggests a period of neglect or abuse because the ambient temperature in which the larvae develop in the living body with a constant temperature. The presence of the larvae of flies on a living person remotely suggests a period of neglect or abuse because the ambient temperature in which the larvae develop in the living body with a constant temperature.

DISSCUSION

Ideally entomological evidence should collect forensic entomologist, because they are trained to recognize these clues properly and to assess which are the traces relevant to the case or not. In reality this is not possible. Due to the rapid treatment at the scene they rarely can wait the arrival of a forensic entomologist especially if he has to travel to the scene for several hours. In such cases, the entomological evidence of criminal events collected forensic technicians. Therefore, they should be educated, thought and trained to properly identify and collected such traces are packed. As these living organisms, improver treatment can influence the characteristics sought. This can make it difficult or even impossible forensic entomologist further work and can lead to erroneous conclusions in the expert opinion, that is. an incorrect determination of the relevant facts.

Determining whether a death was a natural one, a suicide or a homicide is of paramount importance in any legal system and it is responsibility of the forensic pathologist. Where insects are found associated with corpses, the forensic entomologist can be a valuable adjunct to the pathologist since

8 Haskell, N.H., Havley, D.A., Wiliams, R.F. Pless, J.E., Use of aquatic insects determining submersion interval, J. Forensic Sci. 34 1989.622-632.

9 Campobaso C.P. Introna F. The Forensic entomologist in the context of forensic pathologists role. Forensic Sci. int. 2001, 120: 132-139

10 Haskell N.H. Entomological collection techniques at autopsy and for specific environments in: Catts EP. Hasvell NP (Eds) Entomology and death: A procedural guide Clemson,SC:Yoyce Print Shop: 1990. pp. 98-110

he can reasonably support and defend his final determination. The goal of medico-criminal entomology is to contribute to the determination of the time, cause, manner and place of the investigated death, especially on badly decomposed corpses or skeletonized human remains, based on the elements which can be inferred the study of insects found on the cadaver or nearby.

Although every forensic case presents a slightly different set of circumstances and has to be tackled individually, it is our opinion the forensic pathologist should work with the forensic entomologist on death investigation of the cadaver, through the collection of arthropods and temperature data both at the death scene and at the autopsy, up to the final report with the interpretation of entomological and other physical evidence.

In many instances of unexplained death, it is a fact that appreciation of the full significance of the autopsy findings may depend on evidence that may be obtained only at the scene and before the body has been moved. Autopsy mast not be performed blindly but in the light of circumstances and of findings at the death scene: according to the circumstances of death the investigation autopsy should be goal orientated to confirm what is already known or suspected. Only a strict cooperation between various professionals can got an overall appreciation of the circumstantial information and findings noted at the death scene and at the autopsy and only collecting insect evidence at each step of the investigation can provide the full potential of medico-criminal entomologist and support admissible forensic evaluation.

No longer admissible that law enforcement officers, death investigators or pathologists could are skeptical or could not appreciate the value of insects as forensic indicators. Insects are an important source of information for forensic scientist and particularly for pathologists. The amount and variety of information contained in necrophagous insects often surprises those who have never had occasion to work with an experienced forensic entomologist.

Actually, the entomologist is still not often included in the investigation from the beginning and he is rarely called upon to visit the death scene. This may be due to several reasons: the first one could be that investigators are generally called to a crime scene at a moments notice at any hour of the day: therefore, entomologists are often not readily available to participate. In some jurisdictions having an entomologist as a routine member of the investigation team could not prove practical. However, as stated the entomologist could and, in this case, should be supplied with specimens collected from the corpse by crime scene investigators.

CONCLUSION

The scene of medico-criminal entomology is dynamic and is in its emerging stage, so its basic standards and techniques are subject to continual revision based on advances in scientific knowledge and methodology . A death investigation usually requires co-ordination between a number of multidisciplinary professions but a close interaction of forensic entomologists with forensic pathologists is strongly recommended.

Forensic entomology is a branch of specialized and interdisciplinary forensics. Its application is mainly in solving death and to determine the elapsed time between the occurrence of death then, when dealing with cases of abuse and neglect of people and animals as well as the determination of a serious criminal offense. Engaging, forensic entomologist when determining the facts surrounding the criminal act is very important safety, complaining is technologically very demanding and complex. Specific knowledge of experts in forensic entomology used from the first touch on the scene, all the way to the final stage of testing and interpretation of entomological traces in strictly controlled laboratory conditions.

Entomological methods are statistically more reliable mainly after 72 hours after death and are superior when compared to other prevalent forensic pathological methods based on post-mortem changes in tissues.

REFERENCES

1. C.L.,Meek.,C.S., Andrews, Standard techniques and procedures at the death scene in:E.P., Cats, N.H.,Haskel (Eds.), Entomology and Death. A Procedural Guide, Joyces Print Shop Clenson, SC.,1990.pp 72-81.
2. R.K., Wright,W.G.,Eckert,Forensic pathology, in: W.G. Eckert(Ed), Introduction to forensic Sciences, CRC Press Boston, 1997, pp, 93-106.
3. M.F.Ernst, Y.H., Caplan, The death scene in:Y.H. Caplan, R.S. Frank, (Eds), Medicolegal Death Investigation, The forensic Sciences Foundation Press, Colorado Springs, 1999. pp. 7-17.
4. N.H. Haskell, R, Hall, V.I. Cervenka, M. A. Clark, On the body insects life stage presence and teir postmortem artifacts, in W.D. Haglund, M. A.Sorg (Eds). Forensic Taphonomy: The Postmortem Fate of Human Remains, CRC. Press Boston, 1997, pp.415-448.
5. P. Nuorteva. Sarcosaprofagous insects as forensic indicators, in; C. G. Tedeschi, W. G. Eckert, L. G. Tedeschi (Eds), Forensic Medicine a Study of Trauma and Enviromental Hazards, Vol. 2 Saunders, Philadelphia, 1977. pp. 1072-1095
6. K. G.V. Smith, A. manual of forensic entomology, British Museum Natural History. London and Cornell University Press, 1986.
7. M. Leclerg, Entomology and legal medicine in: M. Leclerg (Ed.), Entomological Parasitology: the Relations between Entomology and the Medical Sciences, Pergamon Press, Oxford, 1969. pp.128-142
8. M. Benecke, Six forensic entomology cases:description andcommentary. J.Forensic Sci. 43 (1998) 797-805,1303.
9. W.D. Lord, Case histories of the use of insects in investigations, in: E. P., Catts, N. H. Haskell (Eds>), Entomology and Death, A Procedural Guide, Jeyces Print Shop, C;emson SC,1990,pp. 9-37.
10. B. Greenberg. Forensic entomology case studies, Bull Entomol. Sec. Am. 31(1985) 25-28.
11. M. L. Goff, C. B. Odom, Forensic entomology in the Hawailan Islands: there case studies, Am, J. Forensic. Med. Pathol. 8 (1987)45-50.
12. A. L. Byme, M. A. Camann, T.L.,Cyr, E. P., Catts, K.E.Espelie, Forensi implication of biochemical differences among geographic populations of the black blow fly. Pharmia regina (Meigen), J. Forensic Sci. 40 (1995), 372-377.
13. F. Introna Jr., J. D.,Wells, G. Di Velta, C. P. Campobaso, F.A.H. Sperling. in: Procedings of 51st Annual Meeting AAFS Human and Other Animal mDNA Analysis from Maggots, 15-20 February1999, Orlando, FL, (abstract G74-oral communication), pp. 196.
14. B.M.Altamura, F. Introna Jr.,A new possibility of applying the entomological method in forensic medicine: age determination of postmortem mutilation, Med. Leg. Quad Cam 4 (1982),127-130.
15. G.S. Anderson, the use of insects to determine time of decapitation a case-study from British Columbia, J. Forensic Sci.42 (1997) 947-950.
16. N.H. Haskell, D. G. McShaffrey, D. A. Hawley, R.E. Williams, J.E. Pless, Use of aquatic insects in determining submersion interval, J. Forensic Sci.34(1989) 622-632.
17. R.D. Hall, N.H. Haskell, Forensic entomology, Aplications in medicolegal investigations, in: C. Wecht (Ed.), Forensic Sciences, Mathev Bender, New York 1985.
18. W. R. Rodriguez, Decomposition of buried and submerged bodies, in W.D. Haglund, M. A. Sorg (Eds), Forensic Taphonomy: the Postmortem Fate of Human Remains, CRC Press Boston, 1997, pp.459-467.
19. D.J. Pounder, forensic entomology, J. Forensic Sci. Soc 31 (1991) 469-472.
20. N. H. Haskell, R. E. Wiliams, Collection of entomological evidence at the death scene, in: E. P. Catts, N. H. Haskell (Eds), Entomology and Death, A Procedural Guide, Jeyces Print Shop, Clenson, SC. 1990, pp. 82-97.
21. N. H. Haskell, Entomological collection techniques at autopsy and for specific environments, in: E. P., Catts, N. H. Haskell (Eds). Entomology and Death, Procedual Guide, Jeyces Print Shop, Clenson, SC, 1990. pp.98-100.

22. W.U.Spitz, R. S. Fisher, Medeicolegal Investigation of Death Guidelines for the Application of Pathology to Crime Investigation, Charles C, Thomas Publisher, Springfeld 1980.
23. W.C. Rodrignez, W.M.Bass, Insect activity and its relation-ship to decay rates of human cadavers in east Tennessee, J.Forensic Sci.28 (1983), 423-432.
24. D. Comar Postmortem insect activity may mimic perimortem sexual assult clothing puterrns, J. Forensic Sci.43(1998),792-796.
25. B. Greenberg, Flies as forensic indicators, J.MED. Entomol.28 (1991)565-577.
26. J.H.Davis,The medicolegal autopsy: procedures and interpretations in; Y.H. Caplan, R. S. Frank Medicolegal Death investigation, The Forensic Sciences Foundation Press Colorado Springs, 1999, pp.142-154.

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FORENSIC ASPECTS OF THE PROTECTIONS OF EURO

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Abstract: The euro is the official and the single currency of the so called euro zone, which consists of 17 of the 27 EU states. In the euro zone it is used by about 340 million people and 150 million in other countries. The euro has now become the second largest reserve currency. About 14.9 billion banknotes worth about 915 billion Euros are in the circulation. In 2012, according to the European Central Bank (ECB), 531,000 counterfeit euro banknotes have been withdrawn from the circulation. In the first half of 2012 0.0017% of euro banknotes were counterfeited. 97.5% of counterfeit banknotes were found in the euro zone. In the total number of forgeries 77% are denominations of 20 and 50 Euros.

Before Euros were put into circulation, the institutions of the EU laid down several regulations to provide criminal protection of the euro against counterfeiting. A program called "Pericles" was introduced.

Contemporary series of euro banknotes titled "Bridges and gateways" have security features such as: paper, intaglio printing, watermark, see-through number, hologram, light bar, security thread, perforation, ultraviolet properties and the microprint. All euro banknotes have a serial and a control number with which it is possible to verify the authenticity of banknotes.

A variety of security features, incorporated into the euro banknotes, help distinguish genuine banknotes from counterfeits. The simplest formula for the detection of forgeries is *feel - look – tilt*.

The opinion is that the banknotes should remain in circulation for 9 years, and that after that period they need to be changed. New series of Euros named "Europa" should appear in 2013 and will have some new safety features.

Keywords: eurozone, euro counterfeit, euro coins, euro banknotes, euro protection, security features of euro, Europa series.

INTRODUCTION

The European Union (EU) is composed of 27 sovereign states: Austria, Belgium. Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom. These states are located primarily in Europe[2]. The EU operates through a system of supranational institutions and intergovernmental negotiated decisions by the member states. Brussels is de facto capital of the EU.

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2 Several European Union member states have special territories outside Europe. These territories, for historical, geographical, or political reasons, have special status within or outside of the EU. Those EU member states are: Denmark, France, the Netherlands, Portugal, Spain and the United Kingdom.

European Union

The EU's member states cover an area of 4,423,147 square kilometers with a population of over 500 million inhabitants, or 7.3% of the world population.

The EU[3] is an economic and political union. It constitutes an internal single market with the free movement of goods, persons, services and capital.

By establishing a single market, the creation of European single currency became an official objective of the European Economic Community (EEC) in 1961. However, only with Maastricht Treaty the member states were legally obliged to start the monetary union. With regards to the increased economic integration, the EU has become a monetary union in 1999. The name *euro*[4] was officially adopted at the end of 1995. The euro was introduced to world financial markets as an accounting currency on 1 January 1999, replacing the former European Currency Unit (ECU). It remained an accounting currency until Euro banknotes and coins entered circulation on 1 January 2002. National currencies of some member states called the Eurozone began to phase out. The Euro zone was constituted by the EU member states which have adopted the euro as their currency. It consists of 17 countries: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia and Spain.

Eurozone

3 The EU traces its origins from the European Coal and Steel Community (ESCS). The ECSC was first proposed in 1950 by Robert Schuman, French Prime Minister and Minister of Foreign Affairs. That Europe's first supranational community was formally established by the Treaty of Paris in 1951. The Treaty was signed by: France, West Germany Italy and the Benelux states: Belgium, the Netherlands and Luxembourg. The European Union was established under its current name by the Maastricht Treaty in 1993.

4 The euro sign is €. The code is: EUR.

Nowadays, the euro is a single currency, not a common currency.

The euro is also used in countries outside the EU. Monaco, San Marino, and Vatican City have signed formal agreements with the EU to use the euro and issue their own coins. Andorra signed the monetary agreement with EU to use the euro. It came into force in April 2012. Andorra will be permitted to issue its own euro coins as early as 1 July 2013. Montenegro and Kosovo officially adopted the euro as their sole currency without an agreement and, therefore, have no rights to issue the money. All of them are not considered as part of the eurozone by the ECB. All in all, the euro is used daily by more than 330 million Europeans. Additionally, more than 175 million people worldwide—including 150 million people in Africa—use currencies pegged the euro.

The euro is designed to help build a single market. It is doing so by providing a currency used internationally, easing travel of citizens, eliminating exchange rate problems, providing price transparency and so on. It is also intended as a political symbol of integration. The introduction of the euro was a major event in the history of the EU.

The European Central Bank (ECB) is the successor of the European Monetary Institute (EMI). The bank was established in 1998 by the Treaty of Amsterdam. The headquarters is in Frankfurt, Germany. It is one of the seven institutions of the EU according to the Treaty on European Union[5] (TEU), i.e. Maastricht Treaty. It is the central bank for the euro with primary objective to govern the monetary policy of the eurozone which is one of the largest currency areas in the world. ECB is thus one of the world's most important central banks. Since its launch the euro has become the second reserve currency in the world with a quarter of foreign exchanges reserves being in euro.

The monetary authority of the eurozone is the Eurosystem. It consists of the European Central Bank and the central banks of the member states of the eurozone. Since 2002, the euro banknotes have been issued by national central banks (NCBs) and the ECB on a joint basis. The Eurosystem NCBs are required to accept euro banknotes put into circulation by other Eurosystem members. The ECB issues 8% of the total value of banknotes issued by the Eurosystem. The other 92% of the euro banknotes are issued by the NCBs.

EURO COUNTERFEIT

In December 2012 there were 15,687 million of euro banknotes in total value of more than 912 billion of euros in circulation. At the same time, there were more than 102,032 million of euro coins which total value was over 23 billion of euros in circulation. Total value of euro coins and banknotes in the circulations at the end of 2012 was more than 936 billion of euros[6]. That amount of money has surpassed the value of the US dollar in circulations.

Denomination	Quantities	Values
€ 5	1,536,711,000	7,683,555,000
€ 10	2,042,134,000	29,421,340,000
€ 20	2,818.802,000	56,376,040,000
€ 50	6,146,015,000	307,300,750,000
€ 100	1,674,627.000	167,462,700,000
€ 200	186,670,000	37,334,000,000
€ 500	594,283,000	297,141,500,000
Total	14,999,242,000	902,719,885,000

Quantities and values of euro banknotes in circulation (June 2012)

5 The Maastricht Treaty was signed on 7 February 1992 and entered into force on 1 November 1993.
6 European Central Bank data, www.ecb.int. February 7th, 2013.

Denomination	Quantities	%	Values	%
€5	1,613,000,000	10.3	8,100,000,000	0.9
€10	2,171,000,000	13.8	21,700,000,000	2.4
€20	2,988,000,000	19.0	59,800,000,000	6.5
€50	6,437,000,000	41.0	321,900.000,000	35.3
€100	1,706,000,000	10.9	170,600,000,000	18.7
€200	184,000,000	1.2	36,800,000,000	4.0
€500	587,000,000	3.7	293,700,000,000	32.2
Total	15,687,000,000	100.0	912,600,000,000	100.0

The euro banknotes in circulation (December 2012)

Denomination	Quantities	%	Values	%
1c	26,170,000,000	25.6	262,000,000	1.1
2c	20,573,000,000	20.2	411,000,000	1.7
5c	16,570,000,000	16.2	828,000,000	3.5
10c	12,408,000,000	12.2	1,241,000,000	5.2
20c	9.574,000,000	9.4	1,915,000,000	8.1
50c	5,340,000,000	5.2	2,670,000,000	11.3
€1	6,465,000,000	6.3	6,465,000,000	27.3
€2	4,933,000,000	4.8	9,866,000,000	41.7
Total	102,032,000,000	100.0	23,658,000,000	100.0

The euro coins in circulations (December 2012)

*Counterfeit banknotes.*In the second half of 2012 a total of 280,000 counterfeit euro banknotes were withdrawn from circulation. When compared with the number of genuine euro banknotes in circulation (an average 14.9 billion during the second half of 2012) the proportion of counterfeits remains very low (0.0017%).

Period	1/2009	1/2009	1/2010	2/2010	1/2011	2/2011	1/2012	2/2012	Total
Number of counterfeits	413,000	447,.000	387,000	364,000	296,000	310,000	251,000	280,000	2,301,000

Number of euro banknotes withdrawn from circulation

The €20 and €50 denominations continue to be the most counterfeited banknotes. These two most counterfeited denominations together accounted for 82.5% of the total during the second half of 2012. The €100 banknote is the third most counterfeited denomination, accounting for 13.0%. The number of the rest of the counterfeited denomination is very low. The majority (97.5%) of counterfeits recovered in the second half of 2012 were found in euro area countries, with only around 2% being found in EU Member States outside the euro area and 0.5% being found in other parts of the world. More than 50% of counterfeit banknotes of 20 euro were made in Italy. The outstanding counterfeits of 20 euro (even watermarks and holographic effects) were also found in Italy.

Denomination	€ 5	€ 10	€ 20	€ 50	€ 100	€ 200	€ 500
Percentage 1/2012	0.5	2.5	42.5	34.5	17.0	2.5	0.5
Percentage 2/2012	0.5	1.5	42.5	40.0	13.0	2.0	0.5

Percentage breakdown by denomination of counterfeit withdrawn from circulation in 2012

Counterfeit coins. From 2005 to 2011 a total of 1,184,499 euro coins were seized from circulation counting only the denominations of 50c, €1 and €2. Annually, it makes approximately 170,000 counterfeit euro coins. A similar number is seized before it can be released. That is about 340,000 euro coins annually. Comparing that amount with the total amount of coins in circulation, counterfeit coins are relatively rare[7]. The ratio is 1 counterfeit for every 86, 000 genuine coins. Counterfeit 2-euro coins constituted about 60 percent of the counterfeits found in 2011. In the period from 2005 to 2011 counterfeit coins of €2 taken from the circulation made 77%. It represents more than two thirds of all counterfeit euro coins detected. About a half of the counterfeits feature the German national design, but counterfeits have been detected for every issuing country.

Year	50c	€1	€2	Total
2011	28,000	34,500	94,500	157,000
2010	24,900	30,800	130,399	186,099
2009	18,100	25,500	127,500	171,100
2008	15,600	24,500	154,800	194,900
2007	13.000	16,200	181,900	211.100
2006	8,300	14,100	141,400	163,800
2005	4,000	12,800	83,700	100,500
Total	111,900	158,400	914,199	1,184,499

Counterfeit euro coins seized from circulation (2007 - 2011)

EURO PROTECTION

Making the preparation for the introduction of the euro, the EU member states realized the necessity for adopting penalties. To protect the euro in the eurozone and beyond, EU laws aim to ensure proper coordination of anti-counterfeiting measures between national authorities and adequate penalties for counterfeiters under national criminal laws. The Treaty on the Functioning of the European Union considers counterfeit and forgery of means of payment as especially dangerous crimes with a cross-border dimension. On 28 May 1999, The Council adopted the Resolution on improving care through criminal sanctions for counterfeiting in connection with the introduction of the euro[8]. Wishing that the euro is adequately protected in all EU member states before its release into circulation, in order to guarantee a more solid and consistent criminal protection, the Council, the following year, adopted a Framework Decision on the protection of improving prescribing criminal sanctions and other sanctions for criminal act of counterfeiting in connection with the introduction of the euro[9]. The purpose of the Framework Decision was to complement and facilitate the implementation of the Convention on the Prevention of Nations counterfeiting and its Protocol of 20 April 1929. That Framework decision was based on that convention. It is also aimed at obliging EU member states that have not ratified that document to do so as soon as possible. The Framework Decision includes provisions on offenses, penalties, jurisdiction, liability of legal persons and legal entities for sanctions.

On 28 June 2001, the European Council issued the Regulation (EC) no 1338/2001, laying down measures necessary for the protection of the euro against counterfeiting. The Regulation obliges credit institutions and other monetary institutions, involved in the sorting and distribution of coins and banknotes as a professional activity, to withdraw from circulation all euro notes and coins re-

7 The estimate of the European Technical and Scientific Centre is that up to two million counterfeit coins were put into circulation in 2002.

8 *Council Resolution of 28 May 1999 on increasing protection by penal sanctions against counterfeiting in connection with introduction of the euro.* Official Journal of the European Union (OJ), C 171 18.06.1999.p.1.

9 *Council Framework Decision 2000/383/JHA of 29 May 2000 on increasing protection by criminal penalties and other sanction against counterfeiting in connection with the introduction of the euro.* Official Journal of the European Union (OJ), L 140, 1-3, 2000.

ceived which they know or have sufficient reason to believe to be counterfeited. According to the Regulation, Member States shall take measures that are effective, proportionate and pose deterrent sanctions. The Act requires the appropriate identification of all notes and coins received, using the proper technical equipment, in order to establish its authenticity and, when necessary, to submit the notes or coins to the police authorities, without delay, to be forwarded to the National Bureau of Investigation.

The *European Anti-fraud Office* (commonly known as OLAF, from French: *Office de Lutte Anti-Fraude*) is charged by the EU with protecting the financial interests of the European Union. OLAF coordinates anti-counterfeiting measures in the euro zone and makes sure euro coins are well protected. Coins from each member of the euro zone are legal tender across the euro zone and therefore common rules and coordination of anti-counterfeiting measures are needed.

The 'Pericles' action program[10] (the Pericles program) came into existence as a result of the introduction of the euro (European Commission, 2001). It plays a significant role in achieving results in the protection of the euro and the fight against the crime of counterfeiting. The program includes exchanges of information (seminars, workshops, meetings and conferences), training, exchanges of staff and technical, scientific and operational assistance. It is designed to support and supplement the measures undertaken by the member states of the EU and programs established or to be established in order to protect the euro against counterfeiting. The Pericles program promotes the cooperation between the national, European and international authorities responsible for combating counterfeiting of the euro. It supports any other activity that improves the expertise of those concerned by the single currency (police officers, customs officials, financial officials, representatives of the national central banks and national mints, specialized lawyers, or any other professional group concerned). The content of training is multidisciplinary and transnational.

The program initially ran from 1 January 2002 until the end of 2005. Due to its success, the European Commission submitted a proposal for its extension until 31 December 2013. Now, it is extended until 2020.

EURO COINS

The euro coin series comprises eight different denominations: 1, 2, 5, 10, 20 and 50 cent (c)[11], €1 and €2. These 8 different euro coins denominations, one of each totals 3.88 euro.

The euro coins have a common (reverse) side and a national (obverse - head) side. The national side indicates the issuing country. The common sides of the coins show images of the European Union or of Europe[12]. That side shows how much the coin is worth.

Euro coins denominations (common side)

10 The Pericles program was established by European Council Decision 2001/923/EC of 7 December 2001.
11 Sometimes refers as euro cents.
12 The common sides of the eight euro coins have different designs. €2 and €1, 50, 20 and 10 cent show either the European Union before its enlargement on 1 May 2004 or, as of 1 January 2007, a geographical image of Europe. 5, 2 and 1 cent show Europe in relation to Africa and Asia on a globe.

The national sides show country-specific designs, surrounded by the 12 stars of the European Union which means that each coin has a variety of different design in circulation at the same time. Three European microstates, Monaco, San Marino and Vatican City which use the euro as their currency also have the right to mint coins with their own designs on the obverse side. Some states have only one single design on all their coins, others have a different design on each of the eight different coins, while some states have between two and five different designs. All in all, there are 12 member states which mint coins, plus 3 minor states, and 8 different coin denomination of values that makes at least 120 different coins, not counting commemorative and jointly issued coins[13]. All of these coins are minted at numerous national mints across the EU to strict national quotas.

Germay, Greece, Italy, France and San Marino (€2)

Germany, France, Cyprus, Slovenia and Vatican City (50c)

Germany, Belgium, Greece, Spain and France (1c)

Euro coins denominations (national sides)

The current design[14], i.e. design of 2007 differs from the original design of 1999. It shows the enlargement of the EU in 2004[15]. The design still retains all elements of the original designs, including twelve stars. However, the map of the fifteen states is replaced by one showing the whole of Europe as a continent[16], without borders.

The 1, 2 and 5c coins account for approximately 80% of all new coins minted in the eurozone. Due to expenses of producing such low value coins, the Commission and some member states have proposed a common design on both sides of these coins, rather than minting numerous different designs. It will keep costs down.

The €1 and €2 coins are two-toned. The "gold" is an alloy (75% cooper, 20% zinc and 5% nickel). The "silver" is cupronickel (75% copper and 25% nickel). The 10, 20 and 50c coins are an alloy known as "Nordic gold" (89% copper, 5% aluminum, 5% zinc and 1% tin). The 1, 2 and 5c coins are copper-coated steel fourrées. The copper alloys make the coins antimicrobial.

There were many complaints about allergic reactions by some people who handle coins regularly (bus drivers, shop-keepers, etc.). Metallurgical composition of the coins was changed to remove the amount of zinc that they contained.

13 Once a year, each country in the eurozone may issue a commemorative coin. Only the €2 denomination can be used for this. These coins have the same features and properties and the same common side but different commemorative design on the national side.

14 There are, however, some restrictions on the design: it must include twelve stars, the engraver's initials, and the year of issuing. New issues must also include the name of the issuing country.

15 The original proposal from the European Commission was to include Turkey on the map. However, that design was rejected by the Council of the EU.

16 Position of Cyprus was changed in order to be included on the map.

An organization of visually impaired and blind people participated in the design of the euro coins. As a result of this cooperation, euro coins incorporate many features allowing them to be distinguished by touch. Their visual appearance is designed to make them easy to be recognized by persons who cannot read the inscriptions on the coins.

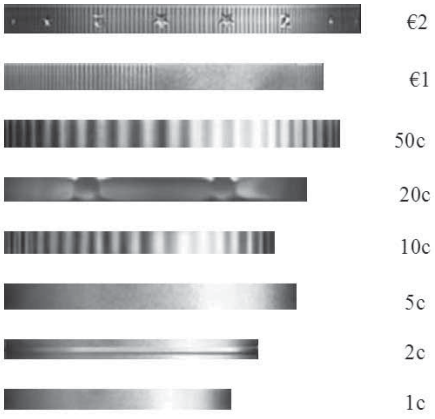
The edges of the 2c, 10c and 20c euro coins

The euro coins increase in size and weight with value. The three lowest denominations (1, 2 and 5c) are small, resemble copper in color and are quite thin and light. The next three denominations (10, 20 and 50c) resemble gold in color and are thicker as well as heavier. The highest two denominations (€1 and 2€) are bimetallic, being generally larger and thicker than the lower denominations. In general, the greater the value, the heavier and larger the coin. Copper color identifies low value; gold color identifies medium value; two different metals identify high value.

Euro coins incorporate high-security machine-readable characteristics. They can be used in vending machines throughout the euro area - no matter where they were issued.

The security features are sophistical bi-metal and sandwich technologies which have been incorporated into €1 and €2 coins. The 10, 20 and 50c coins have also been made of the so called *Nordic gold,* unique alloy which is difficult to melt and is used exclusively for coins.

Lettering around the edge of the €2 coin and the use of a unique metal composition for the 10, 20 and 50 cent coins protects them against counterfeiting. The edges of coins are different and they are also one of the safety features. Therefore, their reproduction becomes extremely difficult.



Edges of euro coins

EURO BANKNOTES

The euro banknotes have seven denominations. The Eurosystem central banks issue banknotes of €5, €10, €20, €50, €100, €200 and €500. "Attractive, secure and user-friendly" were the three primarily objectives of the design but the most important factor in the design of a banknote is its "resistance" to counterfeiting. The name of the contemporary series is "Ages and styles of Europe"[17] and is dedicated to artistic periods of European architecture. The front of the note (obverse side) features windows or gateways while the back (reverse side) has bridges, symbolizing links between countries and with the future. The monuments look similar enough to different national monuments to be acceptable to everyone in the EU and beyond. Banknotes were intended for the use in a large group of countries and to circulate across the borders in a variety of cultures and had to avoid any national or gender bias.

Each banknote has its own dominant color. It enables the note to be easily distinguished from any other euro denominations. Primary colors: red, blue and green were chosen for the widely used banknotes (€10, €20 and €100). These colors are the most easily differentiable. Secondary colors: orange, yellow and purple were chosen for the €50, €200 and €500. The €5 banknote is grey. It is the most widely used note and grey color does not show the dirt as much.

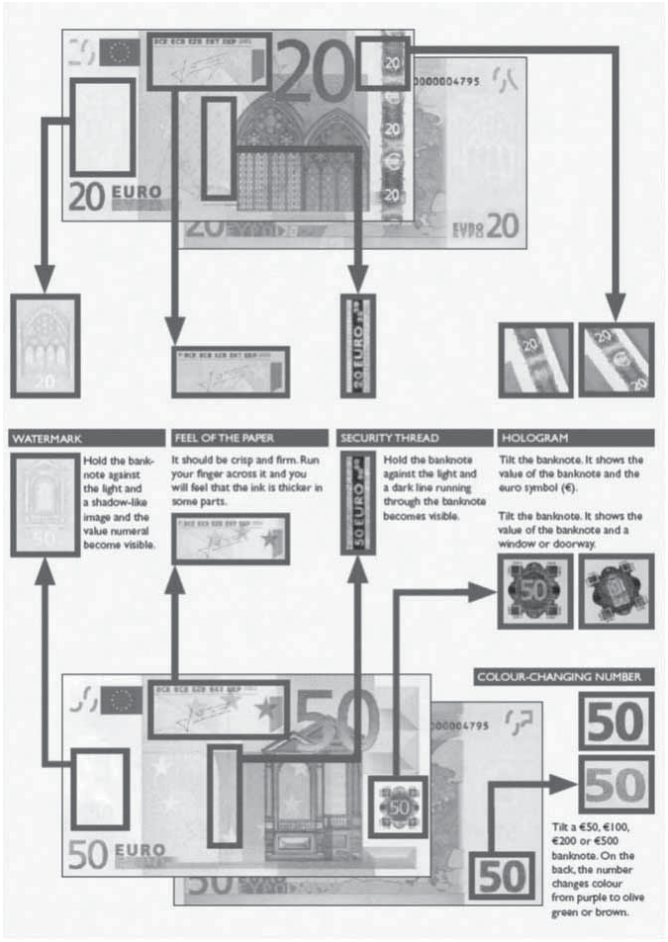
The euro banknotes

17 The banknotes represent following periods and styles: €5 - eighth century BC to fourth century AD, *classical (Greek and Roman)*; €10 - eleventh and twelfth centuries, *Romanesque*; €20 - thirteenth and fourteenth centuries - *Gothic*; €50 - fifteenth and sixteenth centuries, *Renaissance*; €100 -1650 to 1750, *Baroque and Rococo*; €200 - 1850 to 1914, *Age of iron and glass* and €500 - from the 1930 onwards, *Twentieth century architecture*.

The map of Europe is on the reverse side of the banknote. The map includes part of North Africa and Asia Minor. At the right of the world EYPΩ there are small rectangles (boxes) with France's overseas departments (Martinique, Guadeloupe, Guyana and Reunion.

Twelve gold stars appear on the front of the banknote. The stars represent the flag of the EU. They are also on the reverse side of the note.

The only words on the banknotes are the name of the currency (on both sides - in Latin and Greek) and the initials of the ECB (only on reverse side) in different languages[18]. A limited amount of text appears in order to avoid overloading the banknotes and translation problems. The face value of each banknote appears in all four corners on the front and back side of the note. The area surrounding the numerals is designed in a way that makes it more difficult to upgrade the value of a banknote by adding one or more zeros, i.e. turning a €5 note into €50 or €500. the location of the position of face value on both sides aids the orientation of the banknote for insertion into machines.



Easy identifying security features on €20 and €50 banknote

18 The initials of the ECB are written in all European languages used in the eurozone: BCE, ECB, EZB, EKT and EKP. Left of these initials is the symbol © (copyright) and on the right the year of the series. Under that text there is a signature of the President of the ECB.

To enable blind and visually impaired people to recognize them the euro banknotes have different sizes[19].

The euro banknotes are made of pure cotton fibres and are produced by offset, intaglio (only on the front of the note), silkscreen (only on the back of the note) and letterpress printing (only the banknote numbers - on the back of the note).

Every euro banknote has eight security features. They make them easily recognizable by everyone. The relative position and size of the security features are consistent on all banknotes. The security features for public recognition are distributed over the whole surface of the banknote. They are integrated into the general design and they should be ease to recognize.

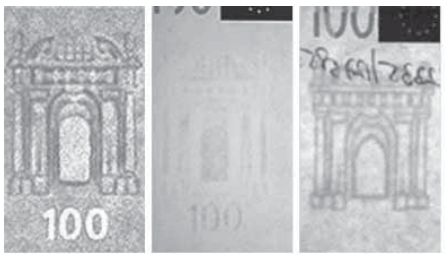
To check the authenticity of banknotes, everybody can use the simple method: *feel - look - tilt.*

Feel. Every person can feel the paper on which the banknotes are printed. The paper is made from pure cotton fibre and has a crisp and firm texture (not limp or waxy). The next thing it can be feel is the raised print. The special printing process called intaglio makes the ink feel raised or thicker. It can be felt by running the finger over it or scratching it gently with the nail. The initials of the ECB are particularly raised.

Raised print

There are additional tactile marks for the visually impaired people on the €200 and €500 euro notes.

Look. The watermarks, the security thread, see-through register and perforations can be seen. The euro banknotes include two different kinds of watermarks[20]. The first shows the main motif of the banknote in a three-dimensional multi-tonal image. Just below it, the second watermark indicates the face value of the banknote. These watermarks are visible when the banknote is held up to the light. If the banknote is on the dark surface, the light areas become darker.



Watermarks (genuine, genuine, counterfeit)

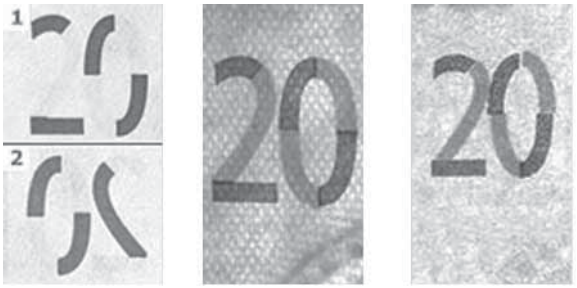
The security thread is embedded in the banknote paper. It is black magnetic and is positioned in the centre of the note. If the banknote is held against the light, the thread will appear as a dark stripe on which the word "Euro" and the value of the banknote can be seen in tiny letters.

19 From the €5 to €100 banknotes, the size increases by 5 mm widthwise and by 6 or 7mm lengthwise. €200 and €500 are less widely used banknotes. They have the same width as €100 and only the length varies.

20 These two watermarks are cylinder mould. There are possibly two more also called watermarks which are: digital watermarks and infrared (or ultraviolet) watermarks.

Security thread

See-through register is incomplete marks printed in the top corner of the banknote, on both sides. When the note is held against the light, they combine perfectly and form the numeral value of the banknote.



See-through register (genuine, genuine, counterfeit)

Perforations can be seen when the banknote is held against the light. It forms the € symbol in the hologram stripe or in the hologram patch. Small numbers showing the value can be seen, too.

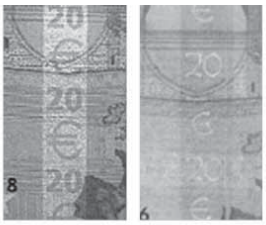
Perforations

Tilt. On the €5, €10 and €20 euro banknotes, on the front side, there is the hologram in the form of a stripe, while on the same side of the €50, €100, €200 and €500 banknotes there is the form of the patch hologram. The banknote has to be tilted to see changes in the hologram stripe or hologram patch[21].

21 When you tilt a low value note, the euro symbol and the value of the banknote appear, as well as a glossy stripe on the back. When the banknote is tilted under bright light, the stripe shines and slightly changes color. When you tilt the front of a high value note, an image of the architectural motif and the value of the banknote appear. When you tilt the back of the banknote, the value numerals change color from purple to olive green or brown.

Holograms (stripe and patches)

On the €5, €10 and €20 banknotes there is a glossy stripe. Tilt the banknote – a gold-colored stripe will appear on the back. It shows the value and the euro symbol. During printing, color-shifting ink was applied on the €50, €100, €200 and €500 banknotes**.** Tilt the banknote – the value numeral on the back will change color from purple to olive green or brown.



Glossy stripe (genuine and counterfeit)

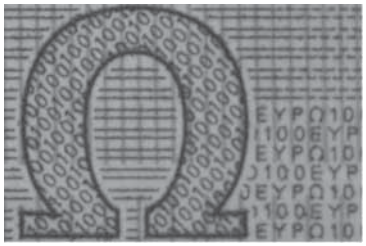
Color-changing number

These mentioned security features are only part of the security features that are applied on the euro banknotes. They usually help ordinary people to recognize the authenticity of the money at a glance. There are many more security features. All in all, there are over thirty. They are: microprint, serial number and letter, checksum, EURion constellation, magnetic ink, bar code, printing code and some more.

The euro banknotes can be checked under the UV light. Banks print special markings in fluorescent ink on their notes. There are certain types of the used paint which glow under these rays and show the pictures that are not seen under normal, sun lighting. UV light is absorbed by the fluorescence and emits visible light. Fake banknotes notes are usually printed on cheaper paper which is slightly fluorescent.

The banknotes €50(one side) and €500 (both sides) under UV light

Tiny characters can be seen on some areas of the banknote. That is microprint. The 0.8 mm print can usually be read with the naked eye. The 0.2 mm microprint, however, simply appears as a thin line to the naked eye. It can be read only with the aid of a magnifying glass. Even printing of this size is sharp, not blurred, on a genuine banknote.



Microprint on a €100

The euro banknotes, unlike the coins, do not have a national side indicating which country issued them. The first character of the serial number is a letter which uniquely identifies the country that issues the note. The remaining 11 characters are numbers which, when calculated, give a checksum also particular to that country. Because of the arithmetic of the checksum, consecutively issued banknotes are not numbered sequentially, but rather, 'consecutive' banknotes are 9 apart.

CONCLUSION

Eleven years have passed from the time when the first euro coins and banknotes were issued. According to the opinion of the ECB, they have to be changed because nine years is enough time for the counterfeiters to master they work.

The coins proposed future changes[22] are as follows:

– the national sides of all denominations of the circulation coins should bear an indication of the issuing state by means of the member state's name or an abbreviation of it;
– the national side should not repeat any indication on the denomination, or any parts thereof, of the coin neither should it repeat the name of the single currency or of its subdivision, unless such indication stems from the use of a different alphabet.

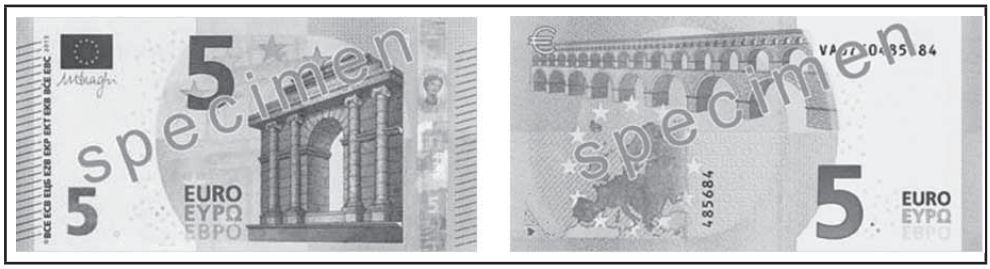
This Recommendation should apply to national sides and edge letterings of both normal and commemorative euro circulation coins.

The euro banknotes should be changed, too. A new series, called "Europa", will be released from May 2013. The new series includes slight changes, notably the inclusion of the face of the mythological princess Europa as a watermark in the hologram stripe as well. In the silvery stripe on the right hand side of the note, Europa will appear in addition to the value of the note and a window.

New production and anti-counterfeiting techniques will be employed on the new notes. The design will be of the same theme and colors identical to the current series but the new banknotes will nonetheless be recognizable as a new series. The new banknotes have been visually modified so that they have a fresh look and accommodate a range of new and enhanced security features, which will also make it easy to differentiate between the two series. The new notes will also reflect the expansion of the European Union.

Cyrillic alphabet is going to be used for the first time on the euro because of Bulgarian joining the European Union in 2007. Therefore, the new series of Euro banknotes will include "ЕВРО" as well as the abbreviation "ЕЦБ" instead of five abbreviations of "European Central Bank". Each of the contemporary EU-member languages will include nine linguistic variants. They will be in a column on the left-hand side of the obverse. The word "euro" in Latin, Greek, and Cyrillic lettering has been moved to a more central position.

22 This is the European Commission Recommendation from 2008. This recommendation is not yet implemented by all eurozone countries.



Europa Series Design of €5

The new series would benefit from advances in banknote technology since the first series was introduced more than ten years ago. Its security features have been enhanced, the ECB said.

REFERENCES

1. *Biannual information on euro banknote counterfeiting*. Press Release of 16 January 2012, European Central Bank, 2012;
2. Cavoski Aleksandra: *Krivicna zastita novcanica Evropske unij*e, Evropsko zakonodavstvo, casopis Instituta za medjunarodnu politiku, Beograd, 12/05;
3. Commission Decision 2005/37/EC of 29 October 2004 establishing the European Technical and Scientific Centre and providing for coordination of technical actions to protect euro coins against counterfeiting. *Official Journal,* 2005, L 19, 73–74
4. Convention of 20 April 1929 for the Suppression of Counterfeiting Currency and its Protocol, League of Nations Treaty Series 1931, No 2623, p. 372;
5. Council Decision 2001/887/JHA of 6 December 2001 on the protection of the euro against counterfeiting. *Official Journal,* 2001, L 329, 1–2;
6. Council Decision 2001/923/EC of 17 December 2001 establishing an exchange, assistance and training program for the protection of the euro against counterfeiting (the 'Pericles' program; as amended by the Council Decision 2006/849/EC of 20 November 2006). *Official Journal,* 2001, L 339, 50–54;
7. Council Framework Decision 2000/383/JHA of 29 May 2000 on increasing protection by criminal penalties and other sanctions against counterfeiting in connection with the introduction of the euro (as amended by the Council Framework Decision 2001/888/JHA of 6 December 2001). *Official Journal,* 2000, L 140, 1–3;
8. Council Regulation (EC) No. 1338/2001 of 28 June 2001 laying down measures necessary for the protection of the euro against counterfeiting (as amended by the Council Regulation (EC) No. 44/2009 of 18 December 2008). *Official Journal,* 2001, L 181, 6–10.
9. Council Regulation (EC) No. 1339/2001 of 28 June 2001 extending the effects of Regulation (EC) No. 1338/2001 laying down measures necessary for the protection of the euro against counterfeiting to those Member States which have not adopted the euro as their single currency (as amended by the Council Regulation (EC) No. 45/2009 of 18 December 2008). *Official Journal,* 2001, L 181, 11.
10. Council Resolution of 28 May 1999 on increasing protection by penal sanctions against counterfeiting in conviction with introduction of the euro, "Official Journal of the European Union" (OJ), C 171 18.06.1999, p. 1;
11. Coustin, Francois de, editor in Chief: *Fact Sheet 138*, Banque de France, Eurosystem, Paris, February 2008;
12. *Euro our money - Novcanice i kovani novac*, European Central Bank, Frankfurt, 2003;
13. *How the euro became our money, A short history of the euro banknotes and coins*, European Central Bank - Eyrosystem, Frankfurt, 2002;

14. Klimek Libor: *Counterfeiting and Protection of the Euro: from the early beginnings to the current legislative development*, Issues of Business and Law, Volume 4, Bratislava, 2012;
15. *Protection of Euro coins in 2011 - Situation as regards euro coins counterfeiting and the activities of the European Technical & Scientific Centre(ETSC), 2011annual report euro coins*, OLAF - EC, 2011;
16. *Report from the Commission based on article 11 of the Council's framework decision of May 2000 on increasing protection by criminal penalties and other sanctions against counterfeiting in connection with the introduction of the euro,* Commission of the European Communities, Brussels, 13.12.2001;
17. *UK enforcement measures for EU regulation 44/2009 and 45/45/2009 on counterfeit Euro - a consultation*, HM Treasury, London, August 2011.

UDC: 343.982.323

BIOMETRICAL IDENTIFICATION VIA FACIAL PHOTOGRAPHY

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Abstract: Increasingly frequent use of security systems nowadays entails new identification methods and improvement of current methods. Face detection is one of most familiar methods. Therefore, this paper presents and defines face biometrics. It explains the personal face detection by using computers, way of processing and storing obtained data and presentation of the existing methods, which are being developed for that purpose. Also treated are the following topics: implementation, advantages and disadvantages, as well as the issue of the need for face biometrics in the modern world. The paper is aimed at acquainting and informing the reader about the working methods and issues confronted in the identification via facial photography.

Keywords: face biometrics, face detection, identification, photography.

INTRODUCTION

Face is the most important part man's exterior appearance, which helps people to recognize and differ each other. Among other physical characteristics and behaviour, person's facial features are always noticed first. They are unique, unchangeable characteristic for every person and based on them every person can be identified even after plastic surgery.[1] In addition to that, based on the facial features we can also find out information about person's age and gender, race and family background (based on similarity), emotional state and the current mood. Today, facial recognition is used as a biometric authentication method, which consists of comparing the photographs of certain person with biometric pattern that is stored in the database. On the other hand, thanks to the growing presence of video surveillance in public areas, persons' identification through photo database searching represents an increasingly powerful tool in criminal practice.

Face recognition as a biometric identification method is a part of the physical biometrics, which is based on the unique characteristics of each person, in this case, the facial features. The basis of this method is the fact that each person has a unique set of physical characteristics that can be measured and compared.[2] This type of identification has been applied in the past, most in the police, where the suspect's photo was used for identification and was compared with the suspect. This was a logical way, since the technology haven't been developed in that time. However, in the meantime, this idea has been more developed, and soon this type of identification was replaced with computer identification, which uses more efficient tools, so a higher level of security can be achieved. Today, cameras, digital photography, video and computers with relevant software packages are being used for human face recognition. This identification method is faster, more convenient and safer than the identification method that was used before.

At the end of the nineteenth and early twentieth century, in the police practice were used two methods for the portrait registration based on the scientific process which, French criminal-law expert and creator of anthropometric identification methods, Alphonse Bertillon[3] had done, and the methods were **personal descriptions** method (*portrait parlé* - which means spoken description), and **photo – registration and identification** with the so-called "sinalectic photography" (three pose

1 M. Savvides, J. Heo, S. W. Park, Face Recognition, *Handbook of Biometrics,* (*eds.* A.K.Jain, P.Flynn,A.A.Ross), Springer, 2008, p. 43.
2 2 Anil K. Jain, Arun A. Ross, Karthik Nandakumar, *Introduction to Biometrics*, Springer, 2011.
3 *Alphonse Bertillon*, a French officer and scientist who did researches in the field of biometric. He interpreted first methods of criminals' registration through anthropometry. In 1890, he published a book "Judicial photography", where he described in details how to take photos of criminals and crime scenes.

photography which shows frontal, right profile and left half profile with free parameters adjustment before photo shooting).[4]

In 1904, in the Act for measurement, description and identification of offenders, *Bertillon method* [5] was envisaged. The first time the photography was used as evidence in the court in 1864, and today is used as evidence in many criminal cases, particularly for offenses of theft, assault and kidnapping.[6]

Biometric face identification is commonly used in environment where a reliable and unobtrusive access control system is needed, for example, access to the banks, insurance companies, company buildings and public administration. It is very often combined with automatic doors and barriers, ensuring an undisturbed pass for people and an efficient and simple control.

In the public sector, the importance of implementation is reflected in crime prevention, because the implementation of this technology provides the capability to identify and recognize terrorists and criminals in the crow, which became more important especially after the terrorist attacks on USA on 11th September 2001.[7]

However, this method of identification still remains a challenge since the face is inclined to changes, which are caused by aging, make-up or wearing glasses. These changes are often a barrier to recognition, especially when it comes to large databases.[8] In addition, another problem is camera position, which has to be at a certain distance from the head, face centered, which is not always possible,[9] and problems also show up due to variation in illumination. This prevents these systems to be widely used in everyday life since. Because of above-mentioned reasons, often happens that there is a false acceptance or false rejection. In order to overcome these problems, new algorithmic approaches are required which would reduce the percentage of errors. This can be achieved by using three-dimensional images, i.e. 3D technology, which helps to overcome the aforementioned disadvantages of 2D technology.[10]

Figure 1: Problem with different lighting conditions, rotation and face position

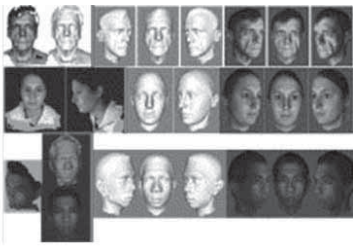

Figure 2: Different angles

HUMAN AND COMPUTER RECOGNITION

Perception enables us to distinguish people from other objects, until identification makes difference among human faces. Man with his/her senses and with the help of the central nervous system identifies, and computers use special technology. If human and computer recognition are compared, level of accuracy in identification can be explained with analyzing figure No.3.

4 V. Mitrovic, *Criminal technic*, Zemun, Belgrade, 1990, pp. 34-44.
5 R. G. Malencic, *Technical police and its work*, printing Jovanovic and Bogdanov, Novi Sad, 1933, p. 110.
6 M. Bromby, Computerized Facial Recognition, Systems: The Surrounding Legal Problems, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1551840, 14/04/2012.
7 M. Bromby, Computerized Facial Recognition, Systems: The Surrounding Legal Problems, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1551840, 14/04/2012.
8 M. Savvides, J. Heo, S. W. Park, *op.cit*. p. 43.
9 D. Dessimoz, C. Champod, J. Richiardi, A. Drygajlo, *Multimodal Biometrics for Identity Documents*, *Research Report*, 2005, page 61
10 M. Savvides, J. Heo, S. W. Park, *op.cit*. p. 44.

Figure 3: On the first sight, with human recognition it looks like these are different persons, while with computer recognition it would be noticed that it is the same person

On the first sight, the human eye would say that these are two different persons. Opposite to the human recognition, computer recognition is quite different. Human brain recognizes the difference in hair colour, hairstyle, glasses, while the computer, on the other hand, is based on mathematical entities measurements such as eyes distance. Therefore, the computer performs calculations that are more precise than the human recognition.[11]

BIOMETRIC TECHNOLOGY AND FACIAL RECOGNITION SYSTEM

In recent years, there has been increasing interest in facial features researching. This technology particularly has progressed in last 10 to 15 years.

In 1960s the beginnings in its development started and its expansion happened in 21th century. The initial systems were designed so that they first locate specific parts of the face (nose, ears, eyes and mouth) in the photos, and after that, the necessary mathematical measurements for comparison were performed. These systems mainly relied on the human factor, because measurements were manually performed, which was the biggest defect of the system.[12]

The turning point in the development of this technology was in 1988, when *Kirby* and *Sirovich* introduced algorithms for facial recognition. *Turk* and *Pentland* gave big contributions in 1991, when they discovered that the *eigenface* technique can be used to automatically detect faces in the photo.[13]

Face biometric is used for verification and identification, but it is more effective with verification.

Verification is control process where certain level of security is established, and shows that a particular person is the one who claims he/she is to achieve a certain aim, such as accessing a certain location or taking some money from an ATM. It is the simplest task that was set for these systems. Therefore, in these cases, the user is already in the database, and to make access granted, taken biometric data needs to match the data which is stored in the database. As a result of the process, the system recognizes or does not recognize the user.[14] Recognizing someone's face is important when it comes to operational methods, or in the fight against terrorism.

Identification is a process that determines the identity of certain person. It is more complex process than verification. In this process, the system compares the image with biometric data in the database to determine the identity. It is important to make difference between ***an open system***, when we do not know whether a person's data are in the database, and **closed**, when we know that certain person is already in the database. In closed systems, the taken photo is compared with other

11 Computerized Facial Recognition, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1551840, 15/04/2012.
12 Biometric gov. Face Recognition, http://www.biometrics.gov/Documents/facerec.pdf, 08/04/2012.
13 *Ibid.*
14 *Ibid.*

photos in the database in order to obtain results. Facial identification, with photo as evidence, is more complicated process, especially when the photo is used as evidence in court proceedings.[15]

Biometric facial recognition technology is simple, because the data which are used for the identification can be easily collected and compared with data in the database. The crucial thing, which provides an efficient operation of these technologies, are well-chosen algorithms. In addition, the efficiency of the recognition depends on other circumstances, such as which camera is used, variations in illumination, head rotation, and so forth.[16]

There are three methods for facial recognition, and those are recognition through[17]:

– photography
– video
– 3D technology

The technology varies because of the different types of recognition. Therefore, on one hand, the technology depends on that whether it is static or dynamic photo, but on the other hand, it depends on application.[18]

There are three main approaches for facial recognition technology:[19]

– method based on appearance
– model based on 2D and 3D recognition
– method based on facial texture

Method based on appearance consists of the view of the entire face appearance, which is obtained by mapping the image from a high dimensional space to low dimensional one, which represents a set of basic vectors. Mapping can be linear or non-linear, and the most commonly used schemes are:

– Principal Component Analysis, PCA
– Independent Component Analysis, ICA
– Linear Discriminate Analysis, LDA. [20]

Each of these approaches has its basic vector of high dimensional space of face vector, based on various statistical aspects. When the face vector is projected on the basic vector, the resulting coefficient is used for recognition.

PCA *(eigenfaces)* is the method for facial recognition, which is most commonly used, and Kirby and Sirovich used it for the first time in 1988. It is based on the face structure, which represents set of *eigenfaces*, facial characteristics, which are extracted and compared.[21] *Eigenfaces* is a set of *eigenvectors* that are used for computer recognition of human face. PCA uses *eigenface* algorithms for dimensional reduction, in order to isolate face characteristics required for recognition. Photos have to be the same size and normalized.

After that, the size of data has to be reduced and the characteristics that can be compared, have to be isolated. Each photo can be represented as a vector of characteristic face in a one-dimensional network. It uses its own vectors (eigenvectors) and values (eigenvalues). Instead of a database, folders are used to store data files and pictures.[22]

Therefore, it is necessary to isolate those characteristics that can be effectively compared. If the probability of error considers as 1:1000, full frontal face needs to be on the photography.[23]

15 *Ibid.*
16 *Ibid.*
17 *Ibid.*
18 Y.W.Zhao, R.Chellapa, *Image-based Face Recognition, Issues and Methods*, http://www.face-rec.org/interesting-papers/General/Chapter_figure.pdf, 14/04/2012
19 Anil K. Jain, Arun A. Ross, Karthik Nandakumar, *Introduction to Biometrics*, Springer, 2011.
20 *Ibid.*
21 Biometric gov. Face Recognition, *op.cit.*
22 Z. Nikolic, *Face recognition using the analysis of the basic components*, TELFOR 2007, Belgrade, Serbia, 20-22 November 2007.
23 Biometric gov. Face Recognition, *op.cit.*

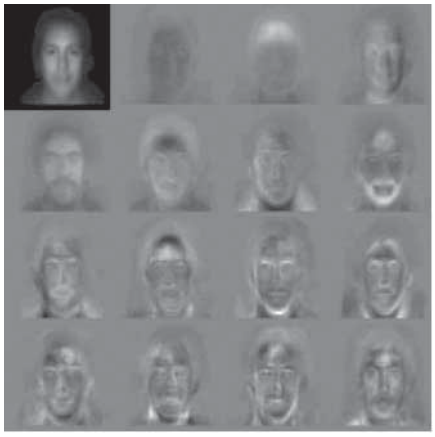

Figure 4: Implementation of PCA method

The lack lies in errors that occur due to variations in illumination and face expressions. Existing problems can be overcome by the LDA, which will be presented next.

ICA method is similar to PCA method. While PCA seeks orthogonal basis, this method is based on finding non-orthogonal basis, so that the transformed characteristics are statistically independent, unlike PCA, which seeks orthogonal basis.[24]

Figure 5: Review of the variations between six classes where LDA is used

The objective of this technique is to increase the difference between the classes, and to reduce the differences within the class. Namely, each row of photos represents a class of pictures where differences are in the faces within the same class. Lack is the fact that there are few samples, which are testers.[25] This method is often used for facial recognition, and various modifications of this procedure were developed (*DLDA* variant and *Gram-Schmidt LDA (GFDL)* variant).[26]

The model-based technology is based on the development of 2D and 3D face models and aims to overcome the above-mentioned problem of variation. *Elastic Bunch Graph Matching (EBGM)* and *Active Appearance Model (AAM)* are examples of the 2D model, and morphable is the 3D model.[27]

These algorithms use the internal face characteristics. Distances between facial characteristics are measured in order to set a reference point for future comparisons. It is based on the analysis of points mostly around eyes, nose and mouth. It is important to emphasize that the change of face

24 M. Savvides, J. Heo, S. W. Park, *op.cit*. p. 47.
25 Biometric gov. Face Recognition, *op.cit.*
26 M. Savvides, J. Heo, S. W. Park, *op.cit*. p. 45.
27 Anil K. Jain, Arun A. Ross, Karthik Nandakumar, *op.cit.*

expression, hairstyle, etc., do not affect the identification. Illumination is not a problem as long as the camera can recognize the face among the objects in the photo.[28]

EBGM is based on the concept face images which have non-linear characteristics, the actual image i.e. those that are not processed in the linear analysis, taking into account variations of illumination (external light comparing to the inner light), pose (standing straight comparing to tilting) and face expressions (smile comparing to the seriousness). Here is used *Gabor [29]filter* to isolate characteristics and to detect shapes. The lack of this method lies in the fact that there are difficulties with setting up and locating faces, but these difficulties can be overcome with implementation of PCA and LDA methods.[30]

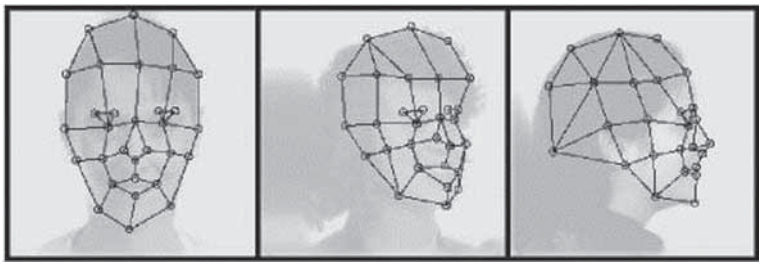

Figure 6: EBMG method

Reliability of facial recognition system is a function of image quality, as well as the demographic characteristics of the population that uses the system. Studies have shown that it is easier to identify men than women, and that is easier to recognize older than younger people. Also, the reliability of facial recognition declines when face print is set in the database and that is why facial recognition technology is less precise comparing with odour recognition technology and fingerprint recognition technology.

AAM is an integrated statistical model that combines a model of variations figure with a model of variations appearance in the frame of normalized form.[31]

3D Morphable Model is a model based on the review of a human face in 3D model, which has more advantages than the 2D model, because pose variations, illumination etc., do not affect the recognition. On the one hand, shape and texture are used as parameters, but on the other hand, the corresponding algorithms are used.[32]

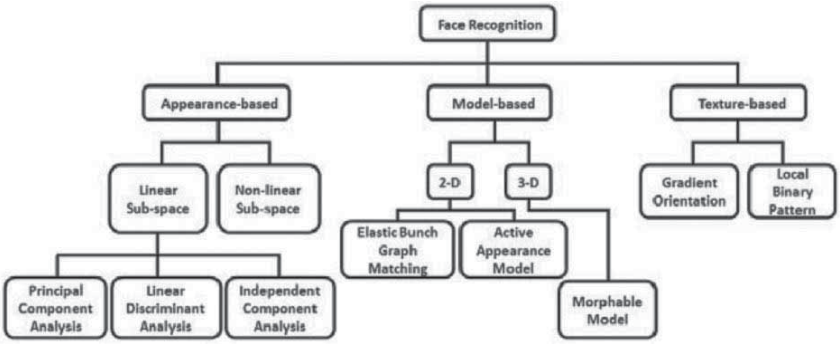

Figure 7: Categorization of face recognition techniques

28 Computerised Facial Recognition, *op.cit.*
29 Hungarian Nobel Prize winner *Dennis Gabor.*
30 Biometric gov. Face Recognition, *op.cit.*
31 X.Lu, *Image Analysis for Face Recognition,* Dept. of Computer Science & Engineering.
32 Facial Recognition Technology, *op.cit.*

A model based on texture tends to overcome the problems of variations in illumination, camera position and face alignment as well as other problems, which have already been mentioned in the text. The examples are the *Local Binary Patterns (LBP)* and *Gradient Orientation*.[33]

The basis of this method is to identify through visual details of the skin, which is performed in that way so that the structure of the skin changes into a numerical code and that sample is stored in a database. It should be emphasised that studies have shown that reliability in the identification is increased by implementation of this method of identification.[34]

LBA represents grey scale of unchangeable characteristics of skin texture, which are common characteristics of skin texture. Many studies have shown that this method gave excellent results.[35]

Gradient Orientation

The experts do a number of database researches in order to find a new generation of algorithms for more efficient recognition and overcoming the existing problems. Previous researches have shown that it is easier to identify men than women, older people than younger ones, and that the transition from external to internal light significantly affects the recognition.

Recognition from Video

Face recognition from video cameras is one way to overcome some of the problems, such as the problem of illumination variation. Here the characteristics, which are needed for recognition, are taken from person who moves around the room. These systems are in the early stages of development and intense researches are still in process. The U.S. government funded the *Multiple Biometric Grand Challenge* (MBGC), which is based on the combination with other biometric data that can be collected from a distance like gait recognition.[36]

However, this method of recognition also has a number of limits that are more difficult for biometric systems to overcome. For instance, the systems need to be such to be able to locate the face on the video where there are numerous objects. These systems are limited by the size of the image. Face images are very small so the requirement of ISO/IEC 19794-5, that the image has 90 pixels, cannot be fulfilled.[37]

Having in mind the above-mentioned limits, it can be concluded that it is necessary to improve the phase of detection and normalization in these systems.

METHODS BASED ON PHOTOGRAMMETRY AND STEREOPHOTOGRAMMETRY

Besides the above mentioned methods, as a result of the progressive development of biometric technology, methods based on photogrammetry and stereophotogrametry have been developed and include: 3D photogrammetric anthropology and 3D facial reconstruction.[38]

The method, which is very important in criminal law, is a 3D photogrammetric anthropology. It is based on the recognition and identification of certain persons from video records that camera captured, such as a surveillance camera.[39]

33 Anil K. Jain, Arun A. Ross, Karthik Nandakumar, *op.cit.*
34 Handbook of Face Recognition, Springer, 2005.
35 M. Pietikäinen, G.Zhao, A. Hadid, http://www.comp.hkbu.edu.hk/~icpr06/tutorials/Pietikainen.html, 13/05/2012.
36 Facial Recognition Technology, *op.cit*.
37 *Ibid.*
38 Z. Radmilovic, *Biometric identification,* 2008, http://www.mup.hr/UserDocsImages/PA/onkd/3_4_2008/radmilovic.pdf, 15/04/2012.
39 *Ibid.*

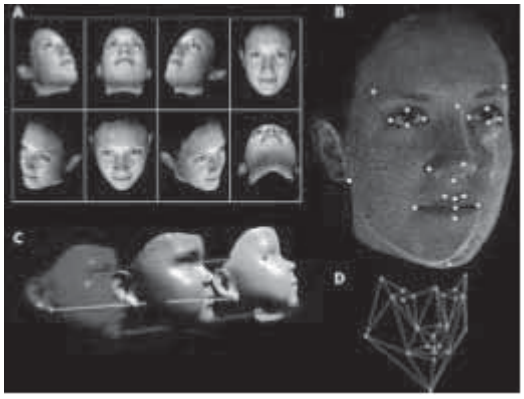

Figure 8: 3D photogrammetric image of a face

Great visual resemblance of digital facial image and head with the actual human appearance can be achieved with 3D facial reconstruction. However, this method is not very reliable, because it is based on a subjective assessment of the person who creates an image of unknown person. 3D facial reconstruction is based on the identification with appropriate software implementation to reconstruct facial characteristics, based on appearance of face and head skeleton. First, the skull has to be recorded in detail, and then measurements of certain points on the face and skull need to be taken. The mentioned measurements imply calculation of the distance of each point on the skull, and thus a digital model is created. During identification, CT scan of the head, which is identified, is placed in superposition (overlapped) with a created digital model. To simulate the final appearance of the face, soft tissue can be added on the skull and the base of the external appearance of the face is obtained, and then, based on the certain characteristics and assessment, skin colour, eyes, hair, and other details of appearance can be determined.[40]

BIOMETRIC SISTEM

In the process of face recognition, first biometric data needs to be scanned and after that, it comes to its processing and preparation for its comparison with previously taken data.

The process of collecting the data is a process where a scanning device accepts data, processes them, perforams compression and prepares them for the database entry. After that, it sets them in a local database, a central base or in a local mobile device (smart card). When it comes to facial biometrics, this process consists of taking some pictures of the person whose information is entered into the database in order to form *faceprint*[41]. It is recommended to take photos from slightly different angles of face toward the camera.

Typical facial recognition system consists of **three modules**: (Figure No. 9)[42]

– data collection process;
– face detection;
– comparison;

40 Z. Radmilovic, *Biometric identification,* 2008, http://www.mup.hr/UserDocsImages/PA/onkd/3_4_2008/radmilovic.pdf, 15/04/2012.
41 *Faceprint* (a series of numbers that represent a face in the database).
42 Anil K. Jain, Arun A. Ross, Karthik Nandakumar, *Introduction to Biometrics*, Springer, 2011.

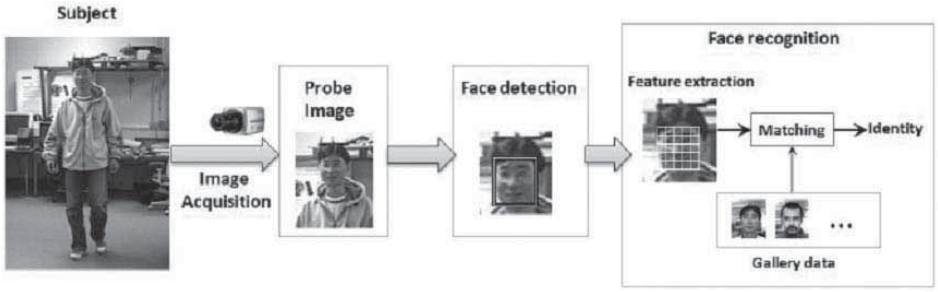

Figure 9: Face detection stages

Face detection is performed in **several phases.** (Figure No. 9) They are:[43]
– detection;
– accommodation;
– feature extraction;
– matching, where localization and normalization are performed.

Detection and accommodation are steps before recognition, and the comparison is performed in feature extraction and matching phases.[44]

The first phase is **detection,** where face is isolated from the background. In the case of video, face detection will be performed with the use of face tracking.[45]

In this phase, photo of a certain person is taken, which can be done with or without the user's knowledge. This reflects the attractiveness of the system. Sampling is performed from a photograph or a video camera. This is simple for people, but is not for computers. The computer first needs to locate the face in the picture.[46] The software searches the faces from video cameras, by seeking in low resolution, and then, when it finds a form of face, switches the camera to a mode with a high resolution. It should also be kept in mind that is much easier to locate the face in the passport photograph than in another environment when you need to isolate a face from other objects.

This is followed by **accommodation phase (matching, settings)** which determines the size and position of the face in relation to the camera. The face needs to be turned 40 degrees toward the camera, so the system can register and analyze it. The biggest number of face recognition systems perform recognition from the so-called "still photo". "Still photo" means the frontal image, with the usual face expression. "Still photo" in relation to the use of "live photo" reduces the size of the numerical code that represents the image in the database.

In this phase, more precise localization and normalization are performed. Location and isolation of the face features is crucial for the efficiency of this system. Localization of facial features such as eyes, nose and mouth is performed with help of dots for localization and normalization is performed, taking into account the geometric performances such as size and pose.

After that, the system allocates the necessary features and performs ***normalization***, which is also an important step in this process. Image standardization is performed in terms of size, pose and illumination, in relation to the images in the database. The aim of normalization is to normalize taken photo, i.e. to be in the same format like the format in the base, in order to compare it.[47] Therefore, in this phase frontal image needs to be normalized in order to get "still photo". That is a statistical technique of correction or reduction of the difference in the face of the same man but in different images. This normalization correction is performed in order to reduce the differences between the various faces.

43 Stan Z. Li Anil K. Jain, *Handbook of Face Recognition*, Springer, 2005.
44 *Ibid.*
45 *Ibid.*
46 Facial Recognition Technology, *op.cit*.
47 Facial Recognition Technology, *op.cit*.

Face normalization needs to be performed with attention on photometric properties such as illumination and gray colours.[48]

The characteristics are isolated using the vector and then they are compared with data from database.[49]

Before final result, coding phase needs to be performed, 2D frontal image is measured and changed to a digital code for the use. Therefore, the algorithm converts person's face into face impression, on the basis of algorithm.

The results depend on the isolated facial features that represent the pattern, as well as method used for classification.[50] After this, the taken sample **is compared** with the sample stored in a database. That is, taken data are used as a filter to be sorted through a database and to get matching on the fastest way.

Recognition methods differ by which algorithms they use to transform the image in order to do a comparison.[51] Therefore, in order to perform the successful face recognition and identification, algorithms and mathematical vectors have to be used.

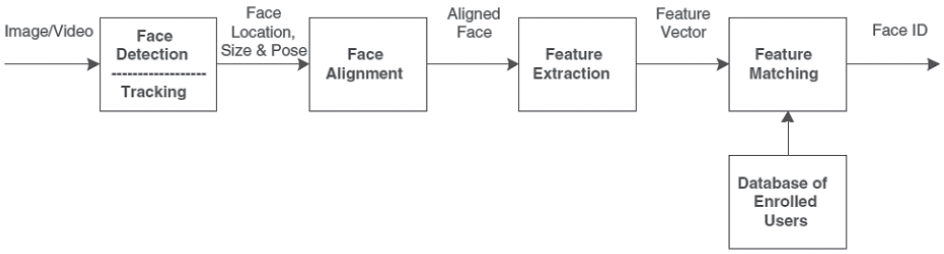

Figure 10: Scheme of the face identification method

THE USE

In this part, the use of biometrics and the importance of its use in both public and private sectors will be explained. The analysis was performed by areas of application. Only certain areas are processed, because it was not possible to analyze each area, as it is a wide field of application.

Face biometric has traditionally been used for official documents, such as passports, driver's licenses and ID cards. The first users of face recognition systems were the police and the courts. Today this technology is applied in various fields of social life and, among other things, on the border crossings, when there is a physical access to certain locations and data, with cash transactions etc.

Security Surveillance in the Police and Judiciary

This is particularly important in the fight against terrorism and crime, and therefore it is used the most in the investigation, i.e. when the suspects in the mass needs to be found. With this biometric method, police supervise certain room in a way that verifies the identity of a certain person in the crowd. Therefore, this is very important in the fight against terrorism.

It is successfully used in investigations and in criminals, suspected terrorist and missing children search. Namely, with the use of this technology, the recognition can be performed from a distance without contact with the person, so he/she does not even realize that he/she is being scanned for identification.

It is also important to emphasise that the use of this method provides a very efficient and fast recognition of football hooligans at the match or cheaters in the casinos. It was first used at a baseball match in Florida in January 2000. Namely, in Tampa, Florida, a trial version of *FaceIt* software

48 Stan Z. Li Anil K. Jain, *op.cit.*
49 *Ibid.*
50 Stan Z. Li Anil K. Jain, *op.cit.*
51 *Ibid.*

was realised for a year, which, on the mentioned match, identified 19 people with criminal records. However, there were no arrests based on it.[52]

It is particularly useful in prison departments as well as in control of the prison database. This biometric method is used for compiling profiles of individuals, which are then compared with the data in the database.

The use at border crossings

This biometric method provides an efficient biometric security control at border crossings. Namely, there are two control passes at the border crossings and those are passport control, where the electronic profile is checked, and iris scan or fingerprint.

Reading passport is an optical method that consists in scanning images and reading the data from the database. It is very important at airports, where there is a high level of security during the authentication, especially since there is a need for higher security for sensitive information and passengers. The use of this technology provides a high level of efficiency at border crossings and airports, as it provides a quick check.

In most countries, the service at border crossings use face recognition system which during its system operation compares the individual's face with the picture in the e-passport microchip, and based on these comparisons confirms if the person is the real owner of the passport or not.

Physical Access to Certain Locations, Facilities, Data, and Personal Devices

This technology is applied in order to increase security of access to the protected locations such as, among others, the military and police facilities, banks, safes, etc.

The use of this method provides more efficient, faster and more secure access to personal devices such as laptops or mobile phones, since the access to these components is restricted by the compared result of a taken biometric sample and the sample from the database. To illustrate, with the help of this method, instead of typing a password in laptop, it is enough that laptop's built-in camera captures the face, compares it with the data in the database and user access is allowed.

User's authentication provides higher security even with the access to certain information, and governments often use this biometric method to limit access to those information. It is particularly important for the access to the police and army information, i.e. in areas where there is a greater need for security.

Money Transactions

In the modern world, the face identification is very important in financial transactions, such as access to ATMs, bank vaults, in order to reduce misuse by identity thieves and hackers who can steal and misuse passwords and PINs.

Other Uses

No less important is the use of this biometric method in the elections. In fact, it happened that people register to vote under different names so they could vote more than once. The use of this identification method disabled this type of abuse. For example, in 2000 *Visionics Facelet* system is used in a fight against election rigging in Mexico. This system analyzed image database with registered polling cards and in that way the duplicates could be identified.[53]

Similar technology is used in the U.S. in order to prevent persons who have more ID and driving licenses applications.

52 *Computer world*, http://www.sk.rs/2005/03/skpr02.html.
53 *Computer world*, http://www.sk.rs/2005/03/skpr02.html.

ADVANTAGES

In order to come to a proper conclusion for the significance of this biometric method, on the one hand it is important to analyze the area of use, and on the other hand, its advantages and disadvantages which will hereinafter be presented.

One of the biometric methods advantages in relation to the others lies in the fact that identification does not require direct contact with the person, so that in some cases the person is not even aware that his/her identity is in determination process.[54] The use of these biometric methods can decrease the crime rate when people become aware that the suspect could be recognized in the crowd, as one properly designed system can identify individuals at airports and other important places.

There are huge databases that can cover a large percentage of the population, such as the base for driver's license in the United States that covers about 95% of the adult population.[55]

Generally, compared to the other biometric methods, people have less aversion when it comes to this method because the way of use is simple and people accept it easier than, for example, a biometric eye scan method. In addition to this, one of the reasons is that earlier the identification was primarily performed by taking photos and people have experience with this method of identification, so they do not resist. In addition, this method is often used, and people do not fear of potential health problems, as they do in those situations when it comes to the retina scan and possible skin diseases, or biometric fingerprint methods. There is a growing interest in this method, especially in the areas of access to certain networks, such as *Facebook*.[56]

DISADVANTAGES

Besides the above-mentioned advantages, this biometric method has also many disadvantages. First of all, the technology, which this method uses, is accurate enough for verification – authentication, but it is insufficient for identification. Performance depends on the faces, i.e. make-up use, glasses, different hairstyles, and a particular problem are difficulties in spotting the difference when twins are checked.

Also, one of the disadvantages is that the face, unlike the iris of the eye, is not that unique as it changes considerably over the years, and because of that, the level of security is lower. In order to achieve a higher level of safety, it is recommended to combine this method with other biometric technologies.

Recognition through photos is quite efficient and fast, but the identification process in offence or criminal procedure is difficult and hard work, because the identification of anatomical landmarks by Bertillon's modified system is necessary and it does not often lead to expected results, due to use of cameras with insufficient resolution and unadjusted angles for recording.

In some cases, taking biometric information is prevented. That happens in certain groups of people in India who believe that taking photos steals the soul, or, for example in the countries, where due to religious custom women wear the veil over their faces.

Biometric face recognition system is, as other systems, prone to be attacked by unauthorized persons. The easiest and simplest attack is through photography. That is logical because the photo of a person is easily available to the public. Systems which use video clip can also be very prone to attack, especially because the image from video is very similar to a vibrant picture of particular user. On the other hand, the lack of 3D systems lies in the fact that physiological information are missing.

REFERENCES

1. Anil K. Jain, Arun A. Ross, Karthik Nandakumar, Introduction to Biometrics, Springer, 2011.
2. Biometric gov. Face Recognition, http://www.biometrics.gov/Documents/facerec.pdf, 08/04/2012.

54 Anil K. Jain, Arun A. Ross, Karthik Nandakumar, *Introduction to Biometrics*, Springer, 2011.
55 *Ibid.*
56 *Ibid.*

3. Computer world, http://www.sk.rs/2005/03/skpr02.html.
4. Computerised Facial Recognition, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1551840, 15/04/2012.
5. D. Dessimoz, C. Champod, J. Richiardi, A. Drygajlo, Multimodal Biometrics for Identity Documents, Research Report, 2005.
6. M. Bromby, Computerised Facial Recognition, Systems: The Surrounding Legal Problems, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1551840, 14/04/2012.
7. M. Pietikäinen, G.Zhao, A. Hadid, http://www.comp.hkbu.edu.hk/~icpr06/tutorials/Pietikainen.html, 13/05/2012.
8. M. Savvides, J. Heo, S. W. Park, Face Recognition, Handbook of Biometrics, (eds. A.K. Jain, P. Flynn, A.A. Ross), Springer, 2008.
9. R. G. Malencic, Technical police and its work, printing Jovanovic and Bogdanov, Novi Sad, 1933.
10. Stan Z. Li Anil K. Jain, Handbook of Face Recognition, Springer, 2005.
11. V. Mitrovic, Criminal technique, Zemun, Belgrade, 1990.
12. X. Lu, Image Analysis for Face Recognition, Dept. of Computer Science & Engineering.
13. Y.W. Zhao, R. Chellapa, Image-based Face Recognition, Issues and Methods, http://www.face-rec.org/interesting-papers/General/Chapter_figure.pdf, 14/04/2012.
14. Z. Nikolic, Face recognition using the analysis of the basic components, TELFOR 2007, Belgrade, Serbia, 20-22 November 2007.
15. Z. Radmilovic, Biometric identification, 2008 http://www.mup.hr/UserDocsImages/PA/onkd/3_4_2008/radmilovic.pdf, 15/04/2012.

UDC: 343.983:613.83
543.544.5

SIMULTANEOUS ANALYSIS OF COCAINE AND ITS METABOLITES IN LIVER MICROSOME S_9 FRACTION OF RAT BY LIQUID CHROMATOGRAPHY - MASS SPECTROMETRY

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Abstract: A method applying liquid chromatography-electrospray ionization-ion trap mass spectrometry (LC-ESI-ITMS) for the simultaneous analysis of cocaine and its in-vitro metabolites is described. Cocaine was incubated with mouse liver microsome S_9 fraction firstly, and then the incubation sample was analyzed by LC-ESI-ITMS in full-scan mode. Cocaine and its metabolites were identified from the determination of molecular ions. The metabolites detection was confirmed from tandem mass spectrometry (MS^n) analysisTwo metabolites were identified in the mouse liver S_9 fractions corresponding to the literature reports.

Keywords: liquid chromatography-mass spectrometry; liver microsome; cocaine; metabolism.

INTRODUCTION

Liquid chromatography-mass spectrometry (LC-MS) has been widely applied in the analysis of drugs and their metabolites [1]. The approach has shown higher sensitivity and superior selectivity for the analysis of thermo-labile, highly polar and non-volatile compounds compared to other methods such as high-performance liquid chromatography (HPLC), gas chromatography (GC) and gas chromatography-mass spectrometry (GC-MS). The application of electrospray ion trap mass spectrometry (ESI-ITMS) technique in LC-MS can acquire rich structural information of the analyses [2]. Because drug metabolites often keep the core structure of parent drug after biotransformation, the fragmentation of parent drug obtained by multi-stage tandem mass spectrometric techniques (MS^n) can be used for the identification of metabolites. Consequently, LC-ESI-ITMS has been widely applied in the analysis of drugs and metabolites [3].

Cocaine is an alkaloid being contained in the leaves of *Erythroxylon coca* Lam. or *Erythroxylon novogranatense* (Morris) Hieronymus of Erythroxylaceae plants. The compound is being used as a local anaesthetic. It also shows stimulating action on the central nervous system, when it is used continuously, psychic dependence on its use appears, resulting in its chronic toxicosis. Cocaine is being abused worldwide and is the second most widespread illicit drug in western countries at present [4]. Many analytical strategies have been developed for the determination of cocaine in plants, pharmaceutical samples and biomaterials, including gas chromatography (GC) [5], gas chromatography-mass spectrometry (GC-MS) [6], high-performance liquid chromatography (HPLC) [7] and liquid chromatography-mass spectrometry (LC-MS) [8].

In the present study, a specific and sensitive method applying LC-ESI-ITMS was developed and applied for the simultaneous analysis of cocaine and two metabolites in rat liver S_9 fraction after in vitro metabolism study.

Experimental Chemicals and reagent

Chromatography grade methanol, acetonitrile and analytical grade acetic acid were purchased from Shield Co., Ltd (Tianjin, China). Ammonium acetate was purchased from Dima Technology Inc. (USA). Cocaine was purchased from the National Institute for the Control of Pharmaceutical and Biological Products (Beijing, China). β-Nicotinamide-adenine dinucleotide phosphate reduced form (β-NADPH) was obtained from iPhase Pharma Services (Beijing, China). Rat liver S_9 fraction was prepared from male Sprague Dawley (S.D.) rats (about 8 weeks old) that were purchased from Laboratory Animal Services Center, Liaoning University of Traditional Chinese Medicine. The protein concentration of rat liver S_9 fraction was determined by Bradford method and the concentration of microsome was determined by Omura method.

In vitro incubation and sample extraction

Stock solution of cocaine was prepared in water at a concentration of 50.0 μg/mL. 20 μL of stock solutions were added to 200 μL SD rat liver S_9 fraction solution containing 2.0 mg of microsomal protein. The mixture was shaken 5 min for equilibration in a water bath at 37 °C, and then the incubation was initiated by adding NADPH in the mixture. The final concentrations of test compound, NADPH and microsomal protein were 5.0 μg/mL, 1.0 mmol/L and 1.0 mg/mL, respectively. The reaction was quenched by adding 150 μL of acetonitrile after incubation for 120 min. The samples were then vortex-mixed, placed in ice for 5 min and centrifuged at 14000 rpm for 20 min. The supernatant was pooled together and evaporated to dry at 37 °C under nitrogen stream. The residue was reconstituted in 50 μL of aconitrile, centrifuged at 14000 rpm for 20 min. An aliquot of 10 μL of the supernatant was used for LC-MS^n analysis.

LC/MS^n analysis

Finnigan Surveyor liquid chromatography (San Jose, CA, USA) equipped with a Waters X-terra MS-C_8 reversed-phase column (100 × 2.1 mm, 3.5 μm) was used for the LC separation. The mobile phase consisted of phase A (water, 10 mM ammonium acetate, adjusted to pH 4.0 with formic acid) and B (methanol). The gradient program started with 5 % B and held for 1 min, then changed to 90% B within 5 min, and held for 5 min. The flow rate was 0.2 mL/min. The effluent in the first 2 min was diverted to waste to minimize the contamination of the ion source.

ESI-MS analysis was performed on a LXQ ion trap mass spectrometer (Thermo Fisher, USA). Positive ion mode was used for the determination of cocaine and its metabolites. The MS parameters were optimized by direct infusion of 5.0 μg/mL cocaine in acetonitrile at the flow rate of 10.0 μL/min. Capillary temp was 350 °C. The flow rates of sheath gas, aux gas and sweep gas were 30.00, 8.00 and 2.00, respectively. The voltages of source, capillary and tube lens were 5.00 kv, 1.00 v and 5.00 v, respectively.

Results and discussion

Optimization of LC-MS conditions

Methanol and water with 0.1 % acetic acid and 10 mM ammonium acetate were used as the mobile phases for the LC-ESI-ITMS analysis of cocaine [9, 10]. Solvent gradient-elution program was established by comparing the peak resolution of cocaine obtained from different gradient-elution modes. The $[M+H]^+$ ion of cocaine at m/z 304 was chosen as parent ion for the fragmentation in MS/MS mode. The base daughter ion was m/z 182. Under the optimized gradient-elution conditions, the retention times of cocaine was 8.30 min as shown in Fig. 1.

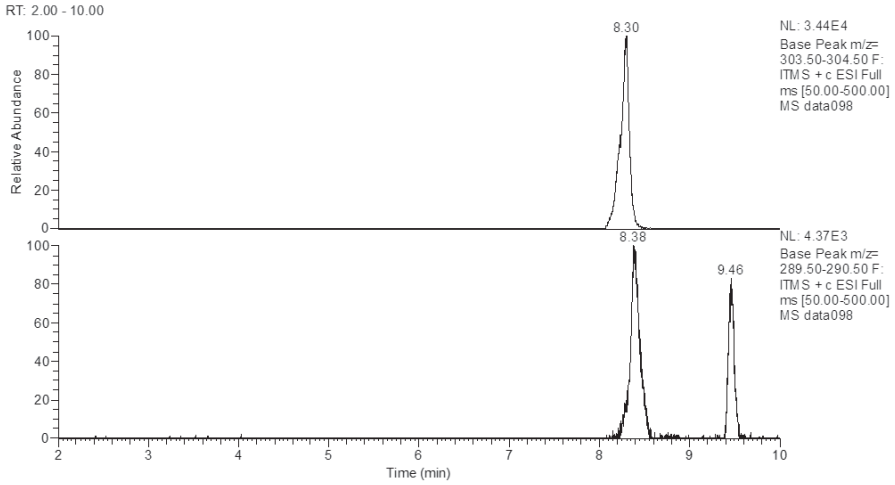

Fig. 1 LC-MS chromatograms of cocaine and its metabolites under the optimized gradient-elution conditions. Peaks identification: 1. cocaine; 2. norcocaine; 3. benzoylecgonine.

Method validation

LC-MS/MS was used for the quantitative analysis of cocaine in rat liver tissue sample. The base fragment ion at m/z 182 was chosen for the quantitative analysis ions, and the MS/MS spectrum of cocaine was shown in Fig. 2B. Selectivity of the method was tested by comparing the chromatogram of blank sample extract of rat liver S_9 fraction with the corresponding spiked extract of cocaine. The obtained result showed that there was no background interference to the analysis of the compound under the optimal LC-MS/MS conditions. Calibration linearity was investigated by analyzing the spiked S_9 fraction extract standards with different concentrations for cocaine. The calibration curve was obtained by plotting the peak-area against the spiked concentrations of cocaine. Good linearity was obtained in the ranges of 0.025 μg/mL to 5.0 μg/mL for cocaine with $r^2 = 0.9999$ and the linearity equation was Y=169851X-1846.67. In order to estimate the limit of detection (LOD), spiked samples at different concentrations were analyzed. The LODs developed in the present work was calculated as 0.006 μg/mL for cocaine on the basis of the chromatographic peak for which the signal-to-noise ratio was 3 (S/N=3). The limits of quantitative (LOQ) was calculated as 0.018 μg/mL based on signal to noise ratio of chromatographic peak equal 10 (S/N=10). The recovery test was also processed with spiking 0.18 μg/mL and 1.8 μg/mL of cocaine solution in rat liver S_9 fraction and the mean recovery was 88.3% (n = 5).

In vitro metabolism study

An in vitro metabolism experiment of cocaine was conducted with rat liver S9 fraction. Metabolic stability was determined at the incubation time of 120 min based on the comparison of peak intensities of Cocaine at the incubation time of 120 min to that at 0 min [11]. The metabolic rate was 83.4%, indicating that Cocaine could be easily metabolized in the rat liver S9 fraction, which agreed with the results reported previously [12]. Therefore, not only the detection of Cocaine is important, attention should also be paid on the examination of metabolites in the case of alkaloids poisoning.

Metabolite identification

Because full-scan mass spectra were acquired during the quantitative analysis for metabolic stability, potential metabolites of drugs could be simultaneously detected without the need for sample reanalysis [12, 13]. Extracted ion peaks of molecular ions of the predicted metabolites in the incubated

samples were examined, followed by the investigation on the full-scan mass spectra. Metabolite was detected if the mass chromatographic peak of an expected $[M+H]^+$ ion was observed in incubated sample but not in the corresponding control sample. Two metabolites were detected both at m/z 290 in the incubated sample of cocaine with different retention time. Interpretation of ESI mass spectra of the detected metabolite indicated that the detected ions represented singly charged molecular ions. The corresponding ion peaks were not observed from the analysis of the control samples, indicating that the detected components in the 90-min sample were not resulted from background materials. In order to confirm the metabolite identification, LC-MS^n analysis were performed on the detected ions. The LC-MS^n product ion spectra of metabolites, as shown in Fig. 2C, Fig.2D, Fig. 2E and Fig. 2F, were referenced to the corresponding spectra obtained from the analysis of cocaine standards. Fig. 2C shows that the $[M+H]^+$ ion at m/z 290 and retention time with 8.38 min shows a product ion at m/z 168, resulting from the loss of the methyl group, so the metabolite was identified as norcocaine, which has been identified in the metabolism of cocaine reported in literature [13]. In the same way, another metabolite with $[M+H]^+$ ion at m/z 290 and retention time with 9.46 min shows a product ion at m/z 168 and m/z 136 as shown in Fig. 2F, resulting from the loss of the methyl group, so it was identified as benzoylecgonine based on the report in literatures [9, 10].

CONCLUSIONS

The described LC/ion trap MS method provided simultaneous determination of cocaine as well as its major metabolites in rat liver S_9 fraction. LC-MS^n analysis was used for the confirmation of the metabolites norcocaine and benzoylecgonine, the use of full-scan MS technique permitted rapid and direct detection of metabolites when the samples were analyzed for the quantification of the parent compound. Because many toxic cases of cocaine poison may be caused by oral intake of plant medicines containing the alkaloids, the simultaneous detection of the parent alkaloids and their metabolites may be useful for the simulation of actual poison case. Therefore, this method can be applied for the rapid identification of poisonous alkaloids and their metabolites in forensic and clinically toxicological relevant cases.

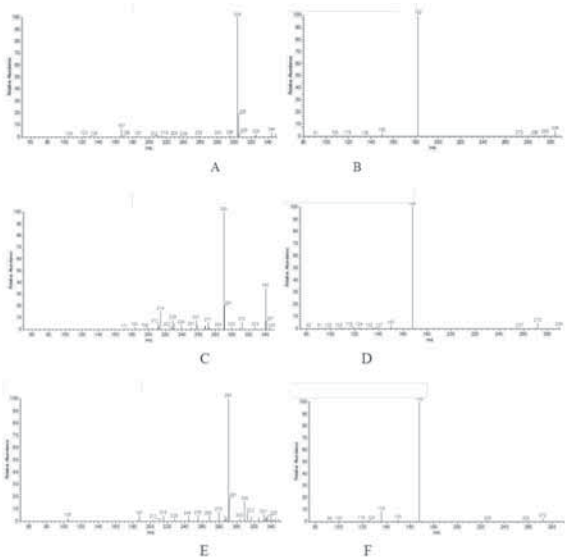

Fig. 2 MS and MS/MS spectrums of cocaine and its metabolites
(A) MS spectrum of cocaine; (B) MS/MS spectrum of cocaine; (C) MS spectrum of norcocaine; (D) MS/MS spectrum of norcocaine; (E) MS spectrum of benzoylecgonine; (F) MS/MS spectrum of benzoylecgonine.

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REFERENCES

1. Xiang P, Shen M, Zhuo XY. Application of LC-MS in the analysis of medicine and abused drugs. Shanghai Shanghai Science and Technology Press, 2009.
2. Cai ZW, Han C, Harrelson S, Fung E, Sinhababu AK. High-throughput analysis in drug discovery: application of liquid chromatography/ion-trap mass spectrometry for simultanoeousl cassette analysis of α-1a antagonists and their metabolites in mouse plasma. Rapid. Commun. Mass Spectrom. 2001, 15: 1637-1643.
3. Cai Z W, Lee FSC, Wang XR, Yu WJ. A capsule review of recent studies on the application of mass spectrometry in the analysis of Chinese medicinal herbs. J. Mass Spectrom. 2002, 37: 1013-1024.
4. Nadia DG, Daniela M. Cocaine and its metabolites in the placenta: A systematic review of the literature. Reprod. Toxicol., 2012, 33: 1-14.
5. Wang XB, Ye NS, Wang JF, Gu XX. Simultaneous determination of cocaine and its metabolite ecgoninemethylester in human blood using microwave extraction-gas chromatography. Chin. J. Chromatogr., 2010, 28 (7): 673-676.
6. Marchei E, Colone P, Nastasi GG, Calabr`o C, Pellegrini M, Pacifici R, Zuccaro P, Pichini S. On-site screening and GC-MS analysis of cocaine and heroin metabolites in body-packers urine. J. Pharma. Biomed. Anal., 2008, 48: 383-387.
7. Sun L, Song J, He W, Ren JQ. Determination of cocaine in rat's serum by high performance liquid chromatography. Chin. J. Forensic Med., 2002, 17 (3): 165-166.
8. Jagerdeo E, Montgomery MA, Lebeau MA, Sibum M. An automated SPE/LC/MS/MS method for the analysis of cocaine and metabolites in whole blood. J. Chromatogr. B, 2008, 874: 15-20.
9. Johansen SS, Bhatia HM. Quantitative analysis of cocaine and its metabolites in whole blood and urine by high-performance liquid chromatography coupled with tandem mass spectrometry. J. Chromatogr. B, 2007, 852: 338-344.
10. Jiang HP. Study on Determining the Cocaine and Benzyolecgonine in the urine. J. Sichuan Univ. (Natural Science Edit ion), 2005, 42 (4): 794-797.
11. Cai ZW, Sinhababu AK, Harrelson S. Simultaneous quantitative cassette analysis of drugs and detection of their metabolites by high performance liquid chromatography/ion trap mass spectrometry. Rapid. Commun. Mass Spectrom., 2000, 14, 1637-1643.
12. Sara Castiglioni, Renzo Bagnati, Manuela Melis, Deepika Panawennage, Paul Chiarelli, Roberto Fanelli, Ettore Zuccato. Identification of cocaine and its metabolites in urban wastewater and comparison with the human excretion profile in urine. Water Res., 2011, 45: 5141-5150.
13. Lu H M, Lu FQ, Tan J Y. Toxicological analysis. Beijing: Policeman Education Press, 1995.

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340.69:531.56/.57

THE STUDY ON THE CORRELATION BETWEEN BALLISTIC IMPACT TRACES ON THE PLAIN WOVEN FABRIC AND THE KINDS OF BULLETS

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Abstract: Ballistic impact traces have distinct edges on the plain woven fabric and could be compared with each other in terms of their morphological characteristics. By using the achievements of textile and terminal ballistic technologies, we summarized the correlation between the ballistic impact traces, which focues on the shape, coloboma, speed, and shape of a bullet, and made theoretical analysis on the correlation between the plain woven fabric and the kinds of bullets, following experimental testing and verification. The simulation results proved that the ballistic impact traces show a close correlation between the shape and impact speed of the bullet. This correlation could be a foundation to discriminate between the kinds of bullets.

Keywords: plain woven fabric; the ballistic impact traces; the kinds of bullets; correlation.

INTRODUCTION

In crime scene investigation, the fabric is a common type of object with traces of bullet contact. When the investigators identify the holes on the fabrics as the bullet holes, they can conclude that the case was a gun-related case. As one of the most important technical examinations in gun-related cases, bullet marks test is a mission of using traces, which are present on bullets and shells, and traces on the targets to determine the kinds of firing gun, the specific gun, and the nature and the process of the case. If in the given conditions the bullets and cartridge cases cannot be found at the crime scene, traces of the bullet contact on the targeted object become the only bullet-related evidence. Currently, there are some difficulties related to using traces of bullet contact on the objects to determine the kinds of guns involved, especially if the traces are found in fabrics. Under normal circumstances, the determination of the kind of the bullet is an effective way to determine the involved kinds of firearms. If the criminal technical staff could use trace of bullet impact on the fabrics to determine the kinds of the bullets and combine the bullet types and firearms, they will limit the scope of the investigation to a large extent. If a bullet can be launched using only a certain firearm, the bullet type can directly determine the model of the gun used.

Plain woven fabric is a modern textile material and has non-homogeneous anisotropy characteristics. Therefore, it is a kind of representative textile material. In this paper, we choose the polyester plain woven fabric as the objects, six domestic representative firearms as launch firearm, shooting at the distance of 2 meters vertically. Observing the trace of the bullet impact, comparing its morphological differences, analyzing the difference in the causes, initially establishes the relations between the bullet holes morphology and bullets types, to provide an effective way for the use of the trace of the bullet impact to identify the type of firearm involved.

THEORETICAL ANALYSIS

Research of the related disciplines

In the plain woven fabric, the warps and wefts of the spatial structure morphology and their mutual relationship are known as the structure; when the warp and weft density is not the same, this structure is called unequal support surface structure. The higher density of the warp or weft, the lower the tear strength is, while the higher anti-high breaking strength is obtained, on the contrary, the lower density of the warp yarns or weft, the higher tear strength is, while breaking resistance is lower. The lower density warps or wefts are broken first, while the higher density warps or wefts

are torn first[1][1]. Relatively in our daily life, such equal support surface structure fabrics are not common, so the fabrics used in the experiments are the unequal support surface structure fabrics.

The terminal ballistic finds that the energy loss during the process of the bullet running through the textile, mainly from yarn elastic energy, kinetic energy of yarn breaking and the yarn kinetic energy. In the same fabric conditions, in the running throughout process, the bullet shape and bullet impact speed plays the decisive effect for the gain and release of the energy of the yarn. The weapons and materials used in scientific research also indicate that the impact of the bullet to the plain woven fabric, yarn material has anisotropic and orthogonal characteristics, a "diamond-shaped" trace will form in the deformation zone in the plane of the fabric, the stress in the fabric having been "cross" distributed, the shape of the impact zone being similar to the head of the bullet shape. The different head of the bullet shape affected the number of pulled yarn number in the impact zone, the blunter the bullet is, the more yarns are pulled out in the fabric. In addition, the axial rotation of the bullet will produce the strong friction on the pulled out yarn and the edge of the bullet holes, the friction effect is proportional to the rotation speed.

Theoretical derivation of the bullet holes form

Combination of materials used in science and ballistics research, we can derive the bullet holes formed by common bullets on the plain woven fabric of unequal support surface structure from a theoretical level, with the pulling yarn number, defect of bullet impact , the bullet holes shape, yarn end divergence as the indicators, according to the experimental results the variation of the curve in reference[2][2], the bullet contact speed of 350m/s, on the base of the flat head and blunt ones classification, further divided into the low-speed pistol and high-speed pistol.

The characteristics of pointed rifle bullets are strong high-speed rotation, short period of time the bullets and fabric contact, less number of yarn gain energy, the warp and weft yarns produced only a very slight tear, then broke quickly, combined with the long bullets high-speed rotation, the yarn should be a serious defect, the yarn ends should be loose. Because the extent tear of longitude and latitude are similar, the stress was "cross" distribution, the shape of bullet holes are square and less yarns will be pulled.

In the process of bullet holes formation by high-speed blunt pistol bullet, the contact period is short, the blunter bullet is, the more yarns were affected in the impact zone. The yarn slight tore and broke quickly. Friction caused by the bomb bullets rotation obviously defects the center of the hole and the yarn end fiber loose, the stress distribution form roughly the square round the bullet holes, the blunt bullet will pull more yarns out.

In the process of bullet holes formation by low-speed blunt pistol bullets, the contact period increased significantly. The Warp and weft yarns are tearing and breaking from the center to the periphery, and make the defect of bullet hole center becomes smaller, loose fibers of the yarn ends are significantly reduced[3][3]. Because of the mechanical property difference of the unequal support surface structure plain weave fabric warp and weft yarns, the stress distribution form the bullet holes roughly oval and the blunt bullets will pull out more yarns.

In the process of bullet holes formation by low-speed flat head pistol bullets, the contact period increased relatively[4][4]. The head of the bullet increases the contact area with the fabric, so it enhances the friction significantly. The annular edge of the flat head bullets play a strong shearing action to the yarns, the shearing force and the frictional force break and tear the fabric yarn along the rotational direction of the bullet, resulting in a larger defect formed by the bullet edge shear and accompanied by obvious pulling yarn phenomenon.

1 [1] Liu Qin, Xie Guangyin, Xiong Yanli. Research of Polyester Fabric Tensile and Tear Properties of Different Structure Plain Weave [J] . Progress in Textile Science & Technology, 2009, 137(1) : 70~ 71.

2 [2] Tan VBC, Lim CT, Cheng CH. Perforation of high-strength fabric by projectiles of different geometry [J] . International Journal of Impact Engineering, 2003, 28(2) : 207~ 222.

3 Li yuchun, Dynamic Response of Plain-woven Fabric Subjected to Ballistic Impact of a Flat Nosed Projectile. J. Journal of Materials Science & Engineering, 2010, 28, 3, 380-384.

4 Li Yuchun, Cheng Keming, Shen Wei, Liu Qiang, Mao Yiming. Analysis on the dynamic response of plain-woven fabric under ballistic impact of projectile, J. Ordnance Material Science And Engineering, 2010, 33(1): 30-35.

TEST PROCEDURE

Test equipment and materials

54 pistol, 59 pistols, 77 pistol, 79-style micro submachine gun, 92 pistol, 9mm Police Wheel guns, 81 rifle, (for the parameters see Table 1), 51 pistol bullets, 59 pistol bullets, 64 pistol bullets, 92 pistol bullets, 9mm police wheel gun bullets, 56-style rifle bullet (for the parameters see Table 2), a digital camera, tape measure, tape, reading microscope, stereomicroscope.

Table 1: The parameters of firearms

Types of firearms	caliber (mm)	commencing speed (m/s)	Bullet equipped	effective range (m)
54 pistol	7.62	420	51 pistol bullets	50
77 pistol	7.62	318	59 pistol bullets	50
79 micro submachine gun	7.62	515	51 pistol bullets	200
81 rifle	7.62	750	56 rifle bullets	400
59 pistol	9	315	59 pistol bullets	50
92 pistol	9	350	92 pistol bullets	50
9mm Police Wheel guns	9	220	9mm wheel gun bullets	50

Table 2: The parameters of bullets

Types of bullets	caliber (mm)	Length (mm)	weight (g)	Shape
51 pistol bullets	7.84	14.90	5.57	blunt
64 pistol bullets	7.84	12.34	4.82	blunt
56 rifle bullets	7.90	31.46	7.90	pointed
59 pistol bullets	9.24	11.18	6.12	hemispheric
92 pistol bullets	9.00	16.34	7.79	point domed
9mm wheel gun bullets	9.00	12.48	4.40	flat

Samples

Use the test firearms shot the polyester plain weave fabric vertically 2 meters away, 50 times per one. Examine the obtained sample with a magnification of 12 times stereoscopic microscope with top light and transmitted light irradiate on the inlet and transmitted light irradiates on the exit, in the lighting conditions, take pictures for the entrance and the exit holes of projectile vertically, and pictures from the side for the rolled yarns, and measure the data by the reading microscope and make statistics, eliminate overlapped bullet holes.

RESULTS AND DISCUSSION

7.62mm caliber bullet holes

Test firearms such as 79-micro submachine gun, 54pistol, 77pistol, 81rifle are all 7.62mm caliber guns produced in China, but with big difference between them. 79 micro submachine gun, 54 pistol and 77-style pistol handgun are all equipped with the same shape as the blunt-head 7.62mm projectiles, but these guns muzzle velocity varied, using a laser gun 2 meters from the muzzle, to measure the contact speed: 79 micro submachine gun's muzzle velocity is 500 m/s, 54 pistol's muzzle velocity is 405 m/s, 77 pistol's is 310 m/s, due to the different impact speed of different three guns, the bullet morphological holes are obviously different in plain weave polyester fabric.

79 micro submachine, high speed gun projectile impacts significantly on the fabric, (see Fig.1), the warp and weft yarns broke in the center of the bullet holes, the broken ends of fibers spread out, in the center of the bullet holes obvious defected, length yarns in the bullet holes became shorter significantly, bullet holes were square, the visible soot appeared around the margin of bullet holes.

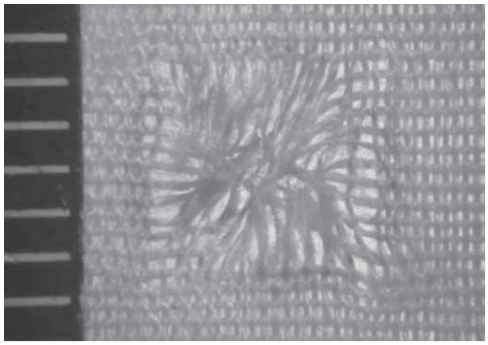

Fig.1: The bullet holes of 79 micro submachine gun

The impact speed of 54 style pistols nearly 95 m/s slower than 79 micro submachine gun bullets, impact effect decreases significantly on the fabric, (see Fig.2), Bullet holes are similar to 79 micro submachine gun's bullet holes, but the defects decreases, and it is difficult to find the soot around the margin of the bullet holes.

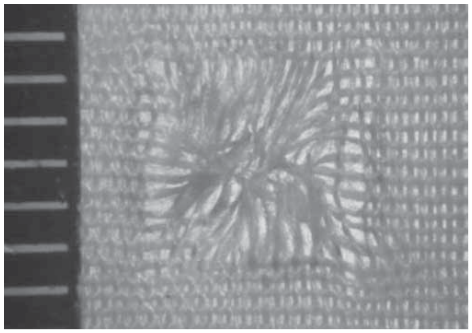

Fig.2: The bullet holes of 54 style pistols

Impact speed of 77-style pistol is the minimum among the three guns, (see Fig.3), The low impact speed does not produce significant defect in the bullet hole center, the weft yarns broke, but the yarn ends intertwined due to the bullets pulling, so that the bullet hole became round, the broken yarns in the center intertwined, the soot are clear around the margin of the bullet hole.

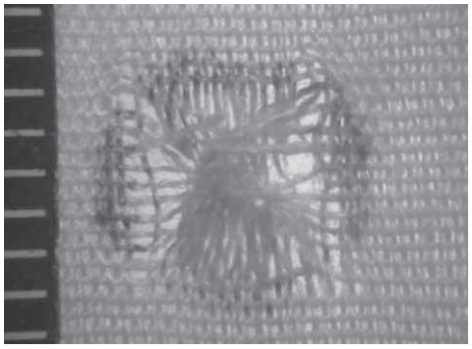

Fig. 3: The bullet holes of 77style pistols

Test firearms, 81 rifle are equipped with the pointed-head 7.62 mm projectiles, the guns muzzle velocity is relatively high, using a laser gun 2 meters from the muzzle, to measure the contact speed is 720 m/s, due to the high impact speed and the pointed bullet form the obvious characteristics bullet holes.

Gun projectile shot by 81 rifle impacts significantly on the fabric, (see Fig.4), most of the warp and weft yarns broke on the edge of the bullet hole, A few long yarns interwoven in the midpoint of each side of the square bullet holes, the four corners of the square bullet holes tore seriously, the near yarn obvious distorted, and the edge bullet holes charred and harden, the yarns rolled to the exit obviously.

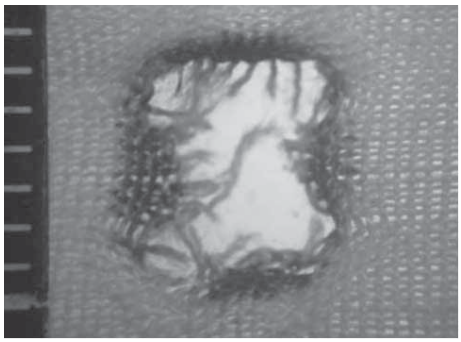

Fig. 4: The bullet holes of 81 style rifle

Discussion about the 7.62mm caliber guns bullet holes

From the bullet holes shot by different kinds of guns, most of the shapes are square. In the case of the same bullet, the contact speed proportional to the degree of defect yarns of the bullet holes, the higher of the speed, the more obviously yarns around the bullet hole moved to the bullet impact zone in the strain, the yarn in the bullet impact zone continue to break, resulting in a more and more serious defect, the projectile velocity is lower, less defect, broken yarn intertwined under the bullets pulling, so the bullet holes become round. When the pointed bullets were used, bullet side tearing effect significantly enhanced, four corners of the square bullet holes were torn seriously into an acute angle, near yarns distorted.

The experimental results shows the yarn breaking are closely related to the projectile velocity, tearing action are closely related to the and bullet-shape, due to the elastic deformation of the yarn, measured by reading microscope, bullet hole diameter is about 6mm, and significantly less than the bullet diameter.

9 mm caliber bullet holes

59-style pistol equipped with 59-style 9mm hemispheric bullet the guns muzzle velocity is 315m/s, using a laser gun 2 meters from the muzzle, to measure the contact speed is 308 m/s, the hemispheric bullet form the obvious characteristics bullet holes.

59 style bullets could pull more yarns, (see Fig.5), the broken yarns gather to the center of the bullet hole, most of the warp and weft yarns broke in the center of the bullet hole, the broken ends scatter obviously, bullet hole are circumference, with a thick soot around the margin.

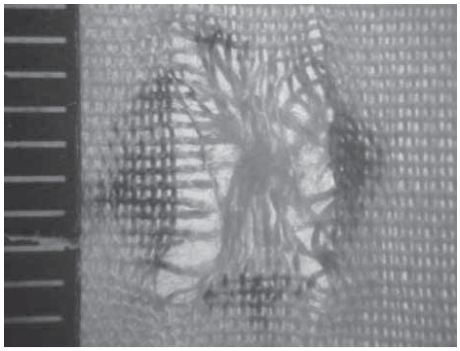

Fig. 5: The bullet holes of 59 style pistols

92-style pistol equipped with 92-style 9mm pistol bullet, with point domed head (the shape is the same as 9 × 19 mm "Parabellum" bullet) the guns muzzle velocity is 315m/s, using a laser gun 2 meters from the muzzle, to measure the contact speed is 322 m/s, the pointed domed bullet form the obvious characteristics bullet holes.

Bullets shot by 92 style pistol impacted the yarns showed obvious broken action, (see Fig.6), the broken ends are neat, reflect the snapping characteristic, parallel yarns defected obviously around the bullet hole margin, four corners of the bullet hole yarns completely broke, bullet hole shape are circumference, with a thick soot around the margin.

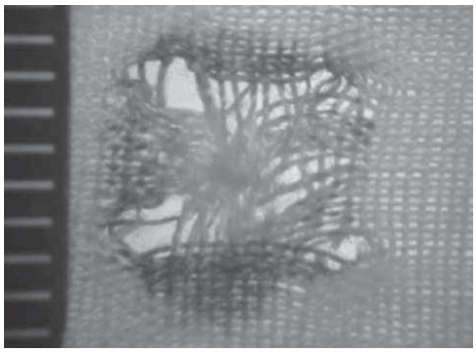

Fig. 6: The bullet holes of 92 style pistols

9mm police wheel gun equipped with 9mm flat wheel gun bullet, the guns muzzle velocity is 220m/s, flat bullet special shapes show obvious shearing action, the bullet hole characteristics are special.

The 9 mm police wheel gun flat bullet body's vertical edge produce shearing action, make the yarn internal stress is greater than the yarn broken failure threshold, yarns break, if the yarns of the across side of the bullet hole are all break, a small piece of fabric will separate from fabric, (see Fig.7), if only one side of the hole are break, a complete weave structure flake fabric will be formed in the center of the bullet hole. Bullet holes, which impact by the flat bullet, show obviously defect on the fabric, the ends of the yarns are neat, rectangular hole with slight soot around the margin.

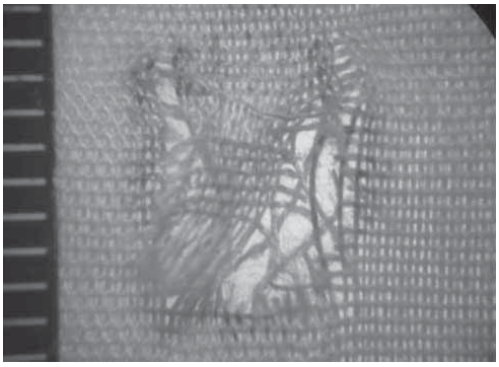

Fig. 7: The bullet holes of 9 mm police wheel gun

The exit shape

The high speed bullets exits

In the experiment, the contact speed of high-speed bullet impact on the fabric were 81 rifle is 720 m/s, 79-micro submachine gun is 500 m/s, 54-type pistol muzzle velocity of 405 m/s, significantly higher than the literature experimental [5] results in the curve of critical impact velocity (i.e. higher than 350 m/sec), Large difference between the impact speed of the different kinds of guns, so the rolled yarns at the bullet hole exit port form show obvious difference, reflected well by 79 micro submachine gun and 54 pistol which using the same kinds bullets. 81 rifle and two other firearms' bullet holes well represented the exit bullet holes form caused by the different shapes of the bullet.

Observe the bullet hole exit formed by high-speed 56 rifle pointed bullets under the transmitted light, the soot around the bullet hole margins in the edge is well ruled out, ,(see Fig.8)"Clover"-shaped bullet holes, small radius circle appears on four corners due to the tearing effect, yarns near the four corners pushing each other visibly, the center yarns long and sparse. Observed from the side of the bullet hole exit, the whole yarns shows "crown" shape, rolled clear, each yarn are large bending,(see Fig.9).

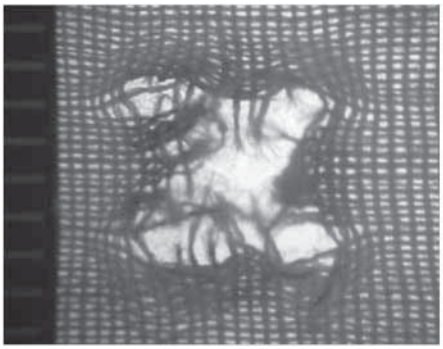

Fig. 8: The exit shape of 81 rifle pointed bullet hole

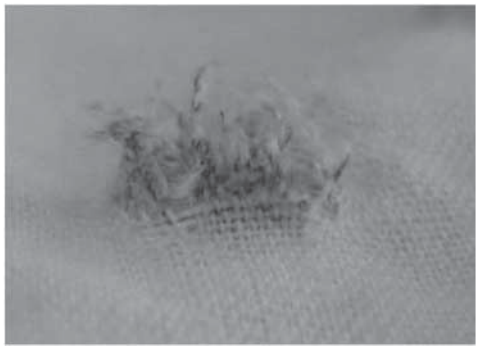

Fig. 9: Observed from the side of 81rifle pointed bullet exit hole

Bullet holes formed by high speed blunt bullets fired for 79 micro submachine guns and 54 pistols, the form of exit bullet hole show the same characters and significant difference as well. (see Fig.10), the impact of high-speed 79-micro submachine gun bullets forms a larger area of the rectangle defect in the internal of the bullet holes, very short broken yarns appears on the margin of the bullet holes yarn valgus, and no yarn in the center of the bullet hole. The lower speed bullet shot by 54 type pistols only form a smaller defect in the center of the bullet holes, the impact scattered fibers

in the yarn into fluff shape, and the yarns show a high degree of transparency under the transmitted light. Observed from the side of the 79 micro submachine gun bullet hole exit, (see Fig.11), the whole valgus yarns are hollow cylindrical-shaped, yarns perpendicular to the fabric, no single bent yarn. The degree of the valgus yarns condition lessened clearly in the bullet hole formed by 54-style pistol.

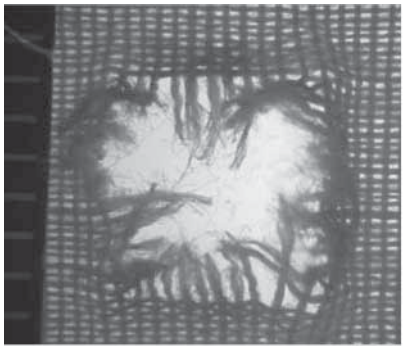

Fig. 10: The exit shape of 79-micro submachine gun blunt bullet hole

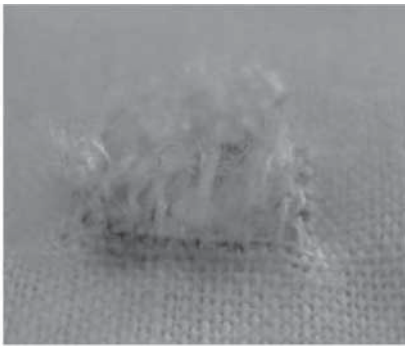

Fig. 11: Observed from the side of 79-micro submachine gun blunt bullet exit hole

The low speed bullets exits

In the experiment, the contact speed of low-speed bullet impact on the fabric are, 92 pistol is 322 m/s, 59-pistol is 308 m/s, 77-type pistol muzzle velocity of 310 m/s and 9mm police wheel gun is 202 s/m, all lower than critical impact velocity (i.e. higher than 350 m/sec). Except the 9mm police wheel gun, all kinds of muzzle velocity are close to each other, and because they have the same speed, the different of the bullet holes exit would reflect the shape of the bullet. While because of the special speed and the bullet of the 9mm police wheel gun, the bullet holes exit of the certain pistol is special.

Bullet hole formed by pointed domed bullet 92-style pistol, (see Fig.12), the exit was "Four Mans Star"-shape, the internal yarns are relatively longer and to the center, and little yarns at the four corners, and more yarns in the center. Observed from the side, the ends of the yarn are neat and the overall shape is like the" pyramid ", (see Fig.13).

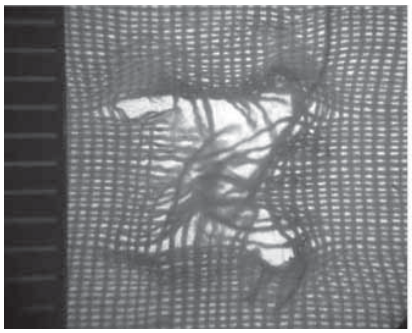

Fig. 12:The exit shape of 92 pistol point domed bullet hole

Fig. 13: Observed from the side of 92 pistol point domed bullet exit hole

Bullet hole formed by blunt domed bullet 64-style pistol, (see Fig.14), the exit was square, no obvious defect in the center of the bullet hole, broken yarns are neat and intertwines in the center of the bullet hole, no reduction in the number of the yarns. Observed from the side, the yarn low-lying bunched in whole , (see Fig.15).

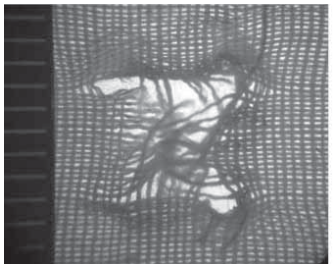

Fig. 14:The exit shape of 77 pistol blunt bullet hole

Fig. 15: Observed from the side of 77 pistol blunt bullet exit hole

Bullet hole formed by hemisphere bullet 59-style pistol, (see Fig.16), the exit was rectangle, the yarns are bent torn due to the strong Hemispherical projectiles pulling, the maximum contact area with the fabric and the bullet of rotation friction, the four corners of the bullet holes are slight tear, a large of yarns defect in the center of the bullet hole, broken yarns are neat and intertwines in the margin of the bullet hole, no reduction in the number of the yarns. Observed from the side, the yarn low-lying bunched little in whole , (see Fig.17).

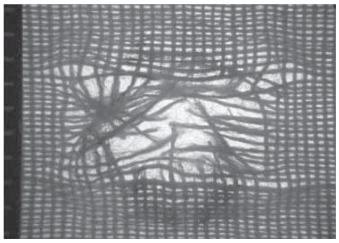

Fig. 16:The exit shape of 59 pistol hemisphere bullet hole

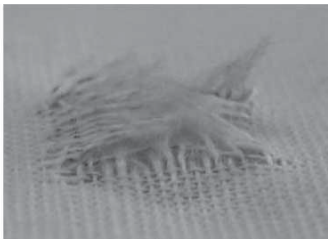

Fig. 17: Observed from the side of 59 pistol hemisphere bullet exit hole

Bullet hole formed by flat bullet 9mm wheel gun, (see Fig.18), the exit was rectangle, the yarns on the margin of the bullet hole broke firstly due to the shearing action of the edge of the bullet. Because the impact action are not high, yarns on the one side of the bullet hole break and release the energy, the other side of the yarn does not reach the fracture threshold is still connected. When the warp and weft yarn density of the fabric is not equal, in the low density direction, both sides of the yarns break severely, in the high density direction, the yarn is only broken at one side. In this condition, both sides of the bullet hole defect obviously, but the center yarns are dense. Observe from the side, the broken ends are neat, sloping shape in whole , (see Fig.19).

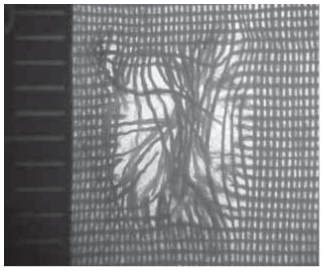

Fig.18: The exit shape of 9mm wheel gun flat bullet hole

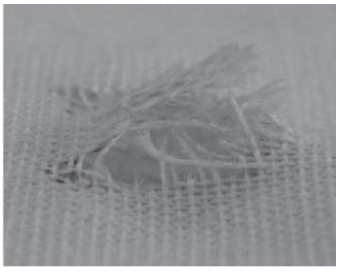

Fig. 19: Observed from the side of 9mm wheel gun flat bullet exit hole

By means of the observation of ballistic impact traces, the regulation of shape, which summarized by us, accord with theoretical analysis result in high degree and the influences of the ballistic impact trace, which reflect the relationship between bullet shape and impact speed, are clearly. In addition, the soot, stick on the edge of bullet hole, become different by the change of the model of gun and bullet. The reason for this situation is the change of gun propellant. The relativity of ballistic impact traces on the plain woven fabric and the kinds of the bullets , successfully control the number of influence factor and prove favorable situation for the analysis the relationship between bullet and ballistic impact traces.

CONCLUSION

The result of theoretical analysis and experimental observation shows that the ballistic impact trace has relevant relationship to the impact speed and the shape of bullet on the plain woven fabric.

Referring to the speed of bullet, the higher the impact speed is, the more defects could appear in the center of the bullet hole. More and more broken yarns appeared, accompanied by the increased disassembly of yarns and serious yarn eversion of the bullet exit hole.

Referring to the shape of bullet, ends of fabric, broken by the pointed rifle bullet, gather in the central part of the bullet hole intensively and the longer broken fabrics are quite few, which get close to the middle of each edge of bullet hole. Blunt bullet could contact more yarns at the moment of impact. Therefore, it may cause more serious defect or crispation. Flat head bullet could use its edge to shear yarns and break these yarn at the edge of bullet hole. The impact of flat head bullet has enough abilities to impact more pieces of fabric and make more defects.

With regard to different model firearm, shot bullets have obviously different to the collection of shape and speed. This phenomenon could prove enough requirement to distinguish the model of firearm and their bullet by the shape of ballistic impact traces on the plain woven fabric. In addition, the soot, sticking on the edge of the bullet hole, also corresponds to the kind of bullet.

REFERENCES

1. LI Yuchun CHENG Keming, SHEN Wei, LIU Qiang, MAO Yiming. Analysis on the dynamic response of plain-woven fabric under ballistic impact of projectile[J]. ORDNANCE MATERIAL SCIENCE AND ENGINEERING, 2010, 33(1):30-35.
2. Gu Bohong. Analytical modeling for the ballistic perforation of planar plain-woven fabric target by projectile[J]. Composites Part B Engineering, 2003, 34(4): 361-371.
3. Li yuchun, Dynamic Response of Plain-woven Fabric Subjected to Ballistic Impact of a Fla-t Nosed Projectile[J]. Journal of Materials Science & Engineering, 2010, 28(3): 380-384.
4. Karahan M., Kus A., Eren R. An investigation into ballistic performance and energy absorption capabilities of woven aramid fabrics[J] International Journal of Impact Engineering, 2008, 35 (6) : 499-510.
5. Tan V B C, Lim C T, Cheng C H. Perforation of high-strength fabric by projectiles of different geometry [J] . International Journal of Impact Engineering, 2003, 28(2) : 207~ 222.

UDC: 343.983:651.925.4
343.983:778.1

A METHOD FOR PHOTOCOPY EXAMINATION BASED ON TONERS

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Abstract: The photocopied document examination is one of the significant contents of the questioned document examination. The traditional method is to use a manually-operated microscope and to ascertain the chemical composition of the toners. This study puts forward a novel method of examining photocopies by the algorithm which can do statistics related to the quantity of the tiny dry photocopy toner dots that distribute on the blank parts of photocopy. Relevant experiments have proved this method to be effective and the study offers the conclusions regarding this method of photocopies examination.

Keywords: forensics, photocopied document examination, toner, digital image processing.

INTRODUCTION

The photocopied document examination occupies an important position in the field of forensic science and it is also one of the significant contents of the questioned document examination.

The main methods for the photocopy examination are in the followings: using microscope manually-operated which is mentioned in Documents [1, 2] and to ascertain the chemical composition of the toners, and this method is mentioned in Documents [3, 4, 5]. In short, each of them has its own unique feature.

This study puts forward a novel method for photocopy examination by applying the knowledge of statistic and digital image processing. The first step is to program an algorithm which can identify "blank toners" and to do statistics related to their occurrence on different photocopies. Then, the statistic data can be compared automatically by using the above algorithm. Therefore the conclusion of the examination would be drawn subsequently. And the "blank toners" mentioned in this study is a term which refers to the tiny dry photocopy toner dots that are distributed on the blank part of a photocopy, which is a common phenomenon of photocopying (see Fig.1).

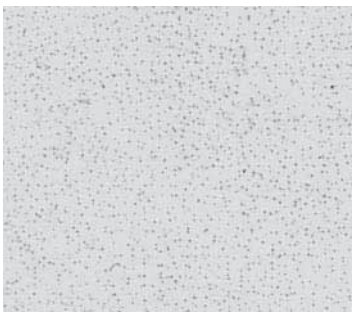

Fig.1. The blank toners on the photocopy

Sometimes, it is normal to see poor photocopies and good photocopies made by different photocopiers, and what cause this lie on various reasons, for instance, the differences of operating frequency, environmental conditions, service time and their maintenance which can all be found in Document [6].

THE BASIC IDEA OF BLANK TONERS EXAMINATION

The basic idea of computer statistical algorithm is how to identify blank toners and do statistic to them by using digital image processing technique. First, to scan the photocopies into the computer by scanner as 24 bits BMP. Choose a surveyed area in the BMP which is the same size of the blank part of the photocopies. Second is the blank toners' identification. Because the gray value of the blank toners is much lower than others in the surveyed area in the BMP, then the blank toners can be identified by setting threshold value of gray.

Definition of "light point" and "dark point" in the BMP image:

The point is called "light point" if the gray value of pixel is more than or equal to the threshold value of gray and meanwhile it is less than or equal to 255. And it is called "dark point" conversely. That is if the supposed premise is F(x ,y) which is set as the gray value of the point (x ,y) and N is set as the threshold value of gray, then point (x ,y) will be taken as "light point" when $255 \geq F(x,y) \geq N$. On the contrary, it will be taken as "dark point".

The numbers of light points and dark points are quite different even in the same sized surveyed areas because the numbers of blank toners on the photocopies by different photocopiers differ from each other. Many light points would be found in those photocopies with high copying quality; while numerous dark points would be seen in those photocopies with low copying quality. Therefore, it would be feasible to distinguish the numbers of blank toners on different photocopies; furthermore the photocopies by different photocopiers would be identified by counting the numbers of light points and dark points.

THE PROPOSED PROGRAM

The program consists of four main units outlined as shown in Fig.4. They are explained in the following:

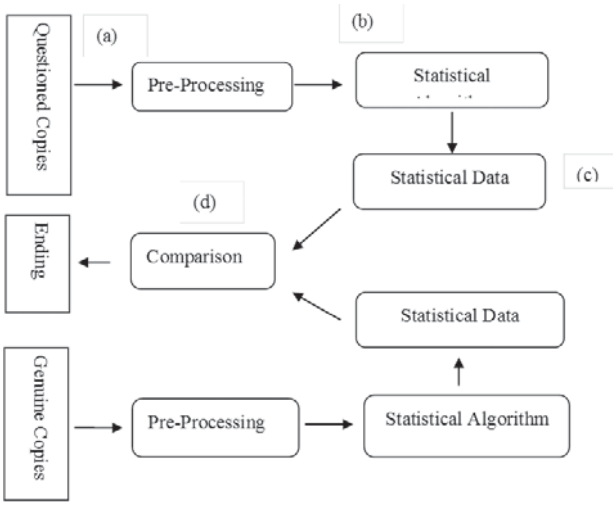

Fig.2: The proposed examination program

Pre-processing

In the pre-processing, the first step is to scan the photocopies into the computer by scanner. The scanning resolution cannot be less than 300dpi and the scan pattern should be color image in order

to make the quality guaranteed. Second, a series of processes would be done to the images. Among them, the most important is the gray transform. According to the theory of YUV color space, Y is brightness weight and contains the information of grayscale. Therefore, it is possible to just use Y to indicate the gray value of a piece of image. However, BMP images are RGB color space. Thus, a formula which is used to calculate gray value of pixel can be summarized according to the corresponding relation between the YUV color space and RGB color space in Document [7].

$Y=0.299R+0.587G+0.114B$ the value of Y: $0 \le Y \le 255$

What should be paid special attention here is that both the questioned photocopies and the genuine ones should be processed under the same condition in the pre-processing by using the same scanning resolution and pattern. Just by doing so, the statistical accuracy would be guaranteed.

Statistical algorithm

Quantitative statistics of light points and dark points: if W and G indicate the quantities of light points and dark points respectively, then Width refers to the largest width of the BMP image, Length refers to the largest length of the BMP image, and F(x,y) indicates the gray value of pixel and N indicates the threshold value of gray.

If $255 \ge F(x,y) \ge N$ $W=W+1$

If $0 \le F(x,y) < N$ $G=G+1$ $(0<x<\text{Width}, 0<y<\text{Length})$

Statistical data

Choose nine different areas as surveyed ones in the blank parts of the BMP image, and the surveyed areas should be of the same size as far as possible. Therefore, not only the chances of error-making would be reduced but also the accuracy of the data statistics would be raised by doing so. Afterwards, the average of numbers of light points and dark points drawn from the fore-mentioned nine times statistics should be taken as the statistical data of the photocopies.

A special case should be mentioned is that it is impossible to make sure that the surveyed areas are of the same size completely, and it would be better to use "gray ratio" (the average of the numbers of the total pixels in the survey areas is divided by the average of the dark points' numbers) to replace the average of the dark points' numbers. The purpose of doing so is to eliminate errors of this experiment.

Comparison

If M is threshold, Q is gray ratio of the questioned photocopies, and Y is gray ratio of the genuine ones. Then the conclusion can be drawn by comparing M with the difference between Q and Y.

EXPERIMENT

Experimental materials

Ten different photocopiers are used in this experiment in order to make the results more reliable. The preconditions are all ten photocopiers should be used under the same working environment and the drums of them should not been changed during the service time. Besides, they should have similar operating frequency. Concrete types of the photocopiers are listed in Table 1.

In this experiment, the same original documents and the same copy papers (Antu Brand, 70GSM, A4) will all be used by these ten photocopiers. And three types of toner densities will be chosen one by one by each photocopier. They are light (the first level), medium (default setting), and dark (the last level). Afterwards, thirty pieces of experimental photocopies would be gotten by doing so.

Table 1: Types of photocopiers

Number	Types of photocopiers	Time (month)
1	Sharp sf-1025	32
2	Ricoh mf-5550	14
3	Sharp sf-2540	26
4	Minolta bizhub162	16
5	Cannon ir2318	11
6	Ricoh mp2000	8
7	Panasonic dp8016p	21
8	Toshiba e-studio166	24
9	Fuji Xerox 1050dc	5
10	Minolta c220	11

Experimental facilities

Canon scanner (Canon CanoScan Lide20);

Acer 5502ZWXCI notebook PC with the following configuration: CPU 1400MHz RAM 512MB, HD 80GB, RADEON X1300 and Windows XP.

RESULTS AND DISCUSSION

Discussion about the threshold value of gray N

Experimental data with the threshold value of gray N is 250 are listed in Table 2.

Table 2: Experimental data with the threshold value of gray N is 250

Number	Density	Average of dark points	Average of total pixel	Average of light points	Gray ratio (%)
1	Light	10259	88023	77764	11.65
	Medium	13916	87978	74062	15.82
	Dark	18220	88118	69898	20.67
2	Light	4104	87681	83577	4.68
	Medium	5156	88111	82955	5.85
	Dark	8393	87978	79585	9.54
3	Light	7326	87044	79718	8.42
	Medium	8815	87812	78997	10.04
	Dark	13956	88452	74496	15.78
4	Light	2761	88687	85926	3.11
	Medium	4384	88621	84237	4.95
	Dark	6536	87972	81436	7.43
5	Light	3565	88692	85127	4.02
	Medium	4921	89124	84203	5.52
	Dark	5754	88171	82417	6.53
6	Light	2412	89652	87240	2.69
	Medium	2721	88523	85802	3.07
	Dark	3352	88965	85613	3.76
7	Light	8946	87125	78179	10.26
	Medium	11583	87621	76038	13.22
	Dark	14879	88201	73322	16.87
8	Light	6157	87420	81263	7.04
	Medium	9485	88024	78539	10.77
	Dark	14142	88963	74821	15.89
9	Light	1945	87912	85967	2.21
	Medium	2131	88209	86078	2.42
	Dark	2390	88218	85828	2.70
10	Light	3619	87226	83607	4.15
	Medium	4283	88312	84029	4.85
	Dark	5219	87915	82696	5.94

Generally speaking, the statistical data are more accurate because the blank toners can be identified sufficiently if the threshold is large. Therefore, it is possible to distinguish the photocopies of different photocopiers by observing the gray ratio.

Table 3: Experimental data with the threshold value of gray N is 100

Number	Density	Average of dark points	Average of total pixel	Average of light points	Gray ratio (%)
1	Light	4369	88023	83654	4.96
	Medium	4651	87978	83327	5.29
	Dark	5216	88118	82902	5.92
2	Light	1741	87681	85940	1.99
	Medium	2130	88111	85981	2.42
	Dark	2467	87978	85511	2.80
3	Light	1523	87044	85521	1.75
	Medium	2104	87812	85708	2.40
	Dark	2412	88452	86040	2.73
4	Light	496	88687	88191	0.56
	Medium	513	88621	88108	0.58
	Dark	556	87972	87416	0.63
5	Light	1063	88692	87629	1.20
	Medium	1243	89124	87881	1.39
	Dark	1329	88171	86842	1.51
6	Light	521	89652	89131	0.58
	Medium	652	88523	87871	0.74
	Dark	696	88965	88269	0.78
7	Light	1231	87125	85894	1.41
	Medium	1469	87621	86152	1.68
	Dark	1925	88201	86276	2.18
8	Light	2164	87420	85256	2.48
	Medium	2693	88024	85331	3.06
	Dark	3124	88963	85839	3.51
9	Light	342	87912	87570	0.39
	Medium	359	88209	87850	0.41
	Dark	392	88218	87826	0.44
10	Light	1246	87226	85980	1.43
	Medium	1368	88312	86944	1.55
	Dark	1412	87915	86503	1.61

It can be driven from the experiment that it is harder to distinguish the photocopies by different photocopiers when the threshold value of gray N diminishes, because the difference of gray ratio of different photocopies diminishes at the same time.

Therefore, to choose a higher threshold value of gray is more feasible (more than 200). And it is appropriate to decrease the threshold value of gray when there are lots of blank toners on poor photocopies.

Effect from toner density of photocopier to blank toners

Generally speaking, the higher the toner density is, the more blank toners there will be. As seen in Table 2, the gray ratios of the photocopies from the same photocopiers increase with the enhancement of the toner density level. However, the degrees of the increase are different. For example, it is obvious to see the increase of gray ratios of the photocopies from photocopiers 1,3,7,8 with different toner densities are rapid, and it shows that the number of blank toners on them increases too. While, the gray ratios of the photocopies from photocopiers 5, 6, 9, 10 with different toner densities raise slowly. Besides, the increase for photocopiers 2, 4 is moderate.

The gray ratios will be quite near to one another when the photocopiers are working with different toner densities. That is because the number of blank toners would increase with the toner density. For example, the gray ratio of the photocopies of the photocopier No. 2 is 5.85% when the toner density is medium. While, the gray ratio of the photocopies of the photocopier No. 10 when

the toner density is dark is 5.94%. From the forensic point of view, it should be paid special attention to this kind of situation during the related examinations. That is to say, even if the gray ratios of the photocopies are quite near to each other, it would not be responsible for the examiner to draw a conclusion that the questioned photocopies and the genuine ones are made by the same machine. It should be fully considered that the blank toners of photocopies are affected by the toner density of photocopier.

Effect from service time of photocopiers to blank toners

It is easy to find the gray ratios of the photocopies of photocopier No. 1 and No. 9 are quite different from each other no matter under which kind of toner density from Table 2. Therefore, the photocopies of them can be distinguished easily.

And what causes this is that the service time of photocopier No. 1 is much longer than that of photocopier No. 9. The drum of photocopier No. 1 is serious aging and its photosensitive property declines greatly due to its long service time of 32 months. Therefore, the number of blank toners of photocopies of photocopier No. 1 is more than No. 9 because of the reasons given above. While for photocopier No. 9 which is just used for 5 months with its drum in high performance, the number of blank toners is fewer than that of photocopies of photocopier No. 1 as a matter of fact.

However, the differences of gray ratios are not quite large if the service time is almost the same to each other. And this conclusion can be proved by the data in Table 2. For instance, the gray ratio of the photocopies of photocopier No. 3 which is used 26 months is nearly the same to that of No. 8 which is used 24 months. The gray ratio of the photocopies of photocopier No. 5 which is used 11 months is nearly the same to that of photocopier No. 10 with the same service time. And sometimes, the gray ratios are quite the same to each other. Take photocopier No. 3 and No. 8 for example, their gray ratios are 15.78% and 15.89% respectively when their toner densities are all set as dark.

Therefore, what should be paid special attention is that sometimes the service time of the photocopiers would be quite close to each other in the process of examination. In another word, the examiner should not make a conclusion hastily that the questioned photocopies and the genuine ones are made by the same machine when their gray ratios are quite near to each other in view of their service time. As a result, the effect of service time to the blank toners should also be taken into consideration before the final conclusion is made.

CONCLUSION

This study puts forward a novel method of examining photocopies by the idea of gray ratio which can signify the quantity of blank toners on the photocopies. From the forensic point of view, it can help determine whether the questioned photocopies and the genuine ones are made by the same machine or not. If their gray ratios are quite different from each other, like the documents of photocopier No. 1 and No. 9 in Table 2, the conclusion can be drawn that they were not made by the same machine. However, the conclusion should not be made hastily even if the gray ratios are almost the same in both copies because of the effect from different toner densities and the service time, like the photocopies of photocopier No. 5 and No. 10. In terms of the systems perspective, what the examiner should do is to take the other means into consideration and make the final conclusion from a holistic perspective.

A fact established in the experiment shown in Table 2 is that if the difference between Q and Y is above 10% when the threshold value of gray is 250, a conclusion can be drawn that the questioned and genuine photocopies are not made by the same machine. Therefore, on account of the above conclusion, the threshold M should be above 10 ($M>10$) in the process of automatic examination to the photocopies by using the program proposed in this study.

REFERENCES

1. Jia Yuwen, Zou Mingli, Complete Works of Chinese Forensic Science ,first ed., Chinese People's Public Security University, BeiJing,2002.
2. Wang Yanji, Wang Shiquan, Course of Forensic Science, first ed., Chinese People's Public Security University,BeiJing,2006.
3. Zimmerman J., Mooney D., Kimmett M.J., Preliminary Examination of Machine Copier Toners by Infrared Spectro Photometry and Pyrolysis Gas Chromatography, J. For. Sci. 31(2)(1986) 489-493.
4. D. Ellen, The Scientific Examination of Documents Methods and Techniques, third ed., CRC Press, 2006.
5. Ordway Hilton, Scientific Examination of Questioned Documents, Revised ed., CRC Press, 1992.
6. Wang Shiquan, Printing Document Examination, First ed., Chinese People's Public Security University, BeiJing, 2001.
7. Rafael.C.Gonzalez, Richard E. Woods, Digital Image Processing, third ed., Prentice Hall, 2007.

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RESEARCH ON INVESTIGATION AND FORENSIC METHOD APPLIED TO INTERNET GAMBLING

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Abstract: With the rapid development of the internet technology, internet gambling crime in China runs rampant. Internet gambling results in a large number of capital outflow cases; it also causes other crimes, seriously damages the economic order in China, and affects social harmony and stability. This article introduces the form and characteristics of internet gambling, the check and control basis of combating internet gambling in China Police, and the investigation procedures in the cases of internet gambling crime. According to the internet gambling crime evidence and forensic principles, this article introduces a concrete forensic method focusing on internet gambling.

Keywords: internet gambling, electronic evidence, forensics.

With the development of internet, the traditional gambling activities have transferred to the web, and internet gambling crime shows the trend of high incidence. Internet gambling becomes faster and more convenient, betting and funds delivery can be completed through the click of a mouse. The betting money amount is great and the social harm is more serious, especially because some criminals use the Internet to organize cross-border gambling activities. This not only does great harm to physical and mental health of adolescents and the normal internet management by corrupting social conduct, but also leads to an illegal outflow of a lot of money, seriously disrupts the economic order and has the impact on social harmony and stability. China is annually robbed of enormous funds that go offshore through Internet gambling, equivalent to China's annual tourism income. Many gamblers dissipate their fortune, but internet gambling also causes other crimes.

THE CRIME FORMS AND CHARACTERISTICS OF INTERNET GAMBLING

Internet gambling crime involves

• Internet gambling website

Through the internet technology to establish gambling sites, online soccer gambling is the most common form of gambling sites. Gamblers bet through using the services provided by the website. Usually soccer gambling web server is overseas, gamblers and property officers are in china. In general online soccer gambling was high in a major tournament, but in recent years, the internet soccer gambling has appeared normal, not just Europe five major league matches, the lower leagues in some countries and regions can also be carried out in soccer gambling. The traditional playing mahjong,21 dot, roulette can also made through the internet gambling website.

• Gambling through live video coverage

In real time internet gambling was televised the Macao casino where gaming industry was developed by using live video mode. With the live video coverage, gamblers do not have to go to the real casino, since they can engage in gambling activities in the casino equipped with cameras, using the Internet video technology and the Internet to transmit baccarat gambling game. The gamblers watched live broadcast online to wager. Winning situations were confirmed in real time, money and winning transferred by the organizer through the bank payment or extraction. Organizers gained profit.

• Gambling through online card games

As an entertainment and making friends platform, internet card game is popular and many people are fond of it. But some websites take in gambling activities by landlords, fried golden flower

and other online games under the cover of the game. Gamblers can buy virtual currency which is as a bargaining chip for games, winning or losing could correspond in the reality to tens of thousands of yuan per day. Finally, the website can make virtual currency to cash, returning to the game player bank Cary. In 2009, police cracked an internet gambling case by online card games in which the amount reached 20 billion.

The characteristics of the internet gambling crime

• High technology

Internet gambling which is different from traditional gambling has the high-tech, the use of modern computer and communication technology to carry out the gambling activities. Many internet gambling crime subjects mastered computer technology and internet technology professionally. With high technical support, internet gambling crime has the characteristics of time short and complex covert means[1]. Much of the crime can be completed in an instant, and often leave no trace, A lot of gambling sites provide reverse forensics course and use flash technology which brings great difficulties to the investigation and trial of the case.

• The characteristic of being virtual

Internet gambling fully embodies virtual character of the Internet technology gamblers can participate in online gambling by registering an account. Internet gambling crime is different from traditional crime which needs a real crime scene and space. Such crimes have brought great difficulty on combating, which is difficult to confirm the identity of the subject of crime.

• The number of personnel and dispersion

In traditional gambling, gamblers will be focused to a specific place for gambling activities. Internet gamblers can participate in gambling with computers and network equipment. So the internet gambling cases involved are scattered all over the country, blossom everywhere, which brings huge difficulty to capture for the police.

• The amount of money involved is enormous, severe social harmfulness

From China recently have cracked several internet gambling cases, the amount of money involved in hundreds of millions of yuan. Gambling sites and gambling group headquarters mostly locates on the outside. All the money, with the exception of a few cases of "pumping", flows to the foreign countries. Funds which were allocated by betting will seriously affect the normal business activities and social life. The internet gambling leads to other crime which brings serious social harm.

Check and control basis of combating internet gambling crime in China Police

Different countries and regions hold different attitudes on the internet gambling. In 2006 the United States Congress passed "Unlawful Internet Gambling Enforcement Act", but in 2011, the Washington state became the first to organize legalized internet gambling in the state. In Europe, the UK in 2005 initiated the legalization of gambling on the Internet, and Italy has gradually introduced online gambling activities in recent years.

In China, internet gambling is banned.

• Law

The 303rd of the criminal law punish opening gambling house crime and gambling crime. The 70th of Security Administration Punishment Law regulations gambling is illegal.

• Judicial interpretations and regulations

1 Chen Wei. Characteristics and detection strategy of Internet gambling [J],: Journal of Jiangsu Police Officer College, 2009.3.

In Article 2 of the Law interpretation on several issues of concrete application for Gambling Criminal Cases: for the purpose of profit, somebody establishes gambling sites in computer internet, or as a gambling site served as a proxy accepting wagers, which belongs to the criminal law 303rd stipulation "casino". In the interpretation of the provisions of article eighth: through the computer internet implementation of gambling crime, the amount can recognize by the betting or winning points multiplied by the actual representation of the amount of each point. On September 3, 2010, the Supreme People's Court, the Supreme People's Procuratorate, the Ministry of Public Security issued "Some advice on applying internet gambling crime law where applicable", the advice provided crime conviction and sentencing standards about online casinos, common crime and punishments against the online casinos, internet gambling crime number, gamble endowment amount and web agent in internet gambling crime, gambling crime jurisdiction, the electronic evidence collection and storage.

THE WAY OF INVESTIGATING INTERNET GAMBLING CRIME

The difficulty of investigating internet gambling crime

• It is difficult to find clue resources of internet gambling

Because of the pyramidal organizational structure of internet gambling gangs and the strong anti-investigation consciousness of core members, it is difficult to find clue resources of internet gambling. Gambling companies use the latest technology to prevent the monitoring of the public security, high quality gambling case cues are more difficult to obtain.

• It is difficult to combat crime source

Because in internet gambling there are cross region, no borders, difference of law in different country, it has little impossibility to combat internet gambling.

• It is important to strengthen multiple police linkage

The investigation of internet gambling relies on multiple police linkage operation. The effective use of technology resources has played an important role in the investigation of such cases. But multiple police linkage mechanism is not mature enough, resource sharing is still not implemented.

• It is difficult to fix electronic evidence

The determination of fact requires electronic evidences to support. But from handled cases, the criminals have a certain understanding of law regulations and the procedure of handling cases. Some criminals often delete computer's dada and change the address of surfing the internet. Some gambling websites are encrypted. Some gambling websites need digital certificate to login.

• It is difficult to expropriated capital involved in the cases

Now form the solved internet gambling cases, gambling money of most cases reaches to 100 million yuan in one month. For commercial purposes, the domestic commercial banks open cards eagerly. Opening cards provides convenience for the criminals who can transfer accounts and remittance by bank cards. Especially the business of the bank on the internet, criminals can break up the whole large money into parts and get the cash immediately, so it is difficult to expropriated capital involved in the cases.

The investigation way of internet gambling crime

- It is the basis of dealing with internet gambling that expands clue resources

Internet gambling betting behavior occurs mainly in the internet, so it is the main source to get information from Internet. Police can get the internet gambling clues through the analysis of the flow characteristics of suspicious funds, police need to communicate with financial department. Police also can get the internet gambling clues by place checking. Police can set up report telephone, website, and email to get internet gambling clues. It can get clues by rousing the masses. In addition, police can excavate clues by strengthening other cases investigation.

- It is the shortcut of dealing with internet gambling cases that chooses the right breakthrough point

To investigate internet gambling cases, there are three key points included personnel flow, information flow, capital flow. Police choose the breakthrough point which should be combined with concrete case and which is in favor of case investigation. As the main way of investigating cases, police had better to choose one or two breakthrough point. Checking the entry point of the choroid and using point to the face, police can investigate the case.

– If police choose the personnel as break through point, it is important to find the internet gambling organization structure, the relationship between every level, the basic situation and action path of the main criminals. As the main direction of the investigation, the agents between the preceding and the following should be the key to investigate. It is important to master the action path of main criminals accurately for the arrest. If the gang members are numerous, the arrest work should have the unity of action so that it will not act rashly and alert the enemy. If the agent level is high in the internet gambling, police should know the members and the organization structure. The arrest opportunity should choose the important football match (such as the World Cup or the European Cup) for which bets are placed during rush hours. The arrest time must keep up with the time of the match. During the arrest, police should secure evidence at the crime scene.

– If police choose the information as breakthrough point, the investigation way is to find the member information, betting online information, agent information. Police can hunt out the facts through this information. But sometimes the criminals included members and agents use a laptop computer and mobile Internet to escape the public security organs fighting crime. Because the high technology of internet gambling crimes, it is necessary to monitor the member and agent at real time. Police can get the IP, login information, betting information by technical means.

– If police choose the capital as breakthrough point, police must master the capital flow. Capital settlement has many ways, but mostly through the bank. Because the bank checks and monitors the capital of internet gambling weakly, much capita of internet gambling flows to abroad. Police should investigate the account c of internet gambling which is opened in the bank. If police do this, they can find the relationship of upper and down line. Now, the third-party payment platform becomes the main channel and tool of internet gambling capital flow.

- It is the protection of dealing with internet gambling cases that multiple police cooperate and cross – border collaborate.

Internet gambling is characterized by great varieties bounded participants, virtualization and internationalization of gambling space. It is a virtual casino which is built through internet. It is not restricted by region, place that crosses region, province, multination. Because of the pyramid-type structure, the agent and members would increase quickly. When police deal with the internet gambling crime, it is the main difficulty to the internet gambling cases that the personnel involved is numerous and scattered in different places. It is necessary for the police to establish cooperation mechanism with multiple and cross-region police agencies. Police should improve information sharing and strengthen the command and coordination. During the procedure of investigating the internet gambling cases, internet security department collects evidence through remote forensics.

Through login the website backstage, police would collect evidence which are each user account weekly betting table, betting account of every number, winning or losing amount.

Police should fix electronic evidence in strict accordance with the forensics program. Technological investigation department master gambling gang structure, activity patterns, modus operandi and other important information. Public order department finds the suspect and fixes the evidence which the information is provided by the internet security and technological investigation department.. The department of legal affairs supports the work in the jurisdiction, applicable law, legal evidence. At the same time, it is the key that people's courts, people's procurator, the Banking Regulatory Commission and communications departments work together during the internet gambling case investigation. Most internet gambling crime occurs abroad, especially the core criminal abroad. If China police want to strike this kind of crime. They need to seek cooperation with other countries' police agencies. They need to establish international collaboration mechanisms.

- It is the key of dealing with internet gambling cases that police collect and fix evidence.

Police could collect and fix evidence according to the regular pattern of settling accounts and betting. Meanwhile, every criminals have their own characteristic during the gambling, police should take appropriate measures.

– The criminals of internet gambling use other's identification information to avoid combat. They can use other's identification information to open bank cards, to rent a house. They also use other's identification information to online. They conceal their identification so that it increase combat difficulty. During the investigation, as police are monitoring the criminals, they should **investigate the** residence so that they can find the true suspect. From capital flow investigation of account opened by the bank, police would find the relationship of the upper and down line.
– The criminals often bet and manage account when they use computer to surf the internet in their residence and temporary residence. When police arrest the criminals in these places, they should collect bank cards, the bank account statement, address book, mobile and notebook. In the inspection process, police should record the site conditions with video equipment.

If the criminal's computer is open and they login the gambling website, police should use safeguard measures to protect the evidence. They had better to print screen of the electronic evidence. If police could not have the account at the scene, they should seizure the electronic device.

EVIDENCE OF INTERNET GAMBLING CRIME AND THE PRINCIPLES AND METHOD OF FORENSICS

From a variety of channels to obtaining internet gambling crime clues, the cases will be preliminary investigated mainly from the internet platform and the money flow chain. In the investigation foundation, internet gambling capture needs unified action and command. The evidence of internet gambling crime and the principles and methods of forensics are very important for the suspected criminal cases.

Evidence of internet gambling crime

The evidence of internet gambling crime includes electronic evidence and traditional evidence. The electronic evidence includes: record of investigation or examination in computer scene, electronic data examination conclusion.

Traditional evidence includes:

– the evidence proving the criminal suspect nature
– the evidence of exposed cases
– the criminal suspects confession and defense
– the testimony of gamblers
– documents and exhibits

The criminal suspects' confession and defense include: the number of gambling, profitability, payment, royalty tap, opened gambling sites and related link services; Gamblers status, endowment amount, winning situations, access to gambling sites username and password. The documents and exhibits include: the bank card, communication tools, bank transfer records, the house leasing contract, gambling web site hosting contract, online registration form, etc.

The principle and method of forensics on internet gambling

According to the law, internet gambling crime includes online organizing gambling and online opening casinos.

• The principle and method of online organize gambling forensics :

First: Gambling website account is the suspect

– Access to the account through technical means, it should become testimony of witnesses by the gambler's statement.
– According to the testimony of gamblers, it could prove its identity and using account.
– According to the account from the computer, it should prove the computer owner.

Second: Proof of illegal profit amount, amount of gambling, organized gambling crime

– According to online profits and gambling-related points conversion, it can calculate profit amount and amount of gambling.
– According to record of the rake-off form and amount from suspects, it can get the evidence of rake-off.

• The principle and method of opening online casinos:

First: Proving that the website is an internet gambling website

– Through scene and remote investigation, it extracts web content which can prove the website page content involving gambling
– Through analysis and test of the website, it confirms the site having a betting and gambling function.
– Second: Proving the suspect using and establishing the website
– According to domain name registration information, web hosting, web space rental contract information, it can demonstrate the site and suspect relationship.
– According to the source codes, it can prove who establishes the website.
– According to the logs, time, ip from the website and the suspect's computer, it can prove who. In addition, if the contact way of gambling sites corresponding to the suspect can confirm the suspect maintain the website

Electronic Forensics

Gambling internet forensics focused on electronic forensics. It mainly includes scene and remote investigation, electronic data examination.

• Internet gambling crime scene investigation

At the scene of the crime, it conducts an inspection in order to extract electronic data, electronic equipment and other information. First scene investigation needs to protect the scene. Because the suspect can destroy the evidence, it is necessary to control the suspect and forbid him to touch the electronic equipment. Second in the scene, it is important to extract and fix easily lost data, such as the opening gambling web, the chat record etc. After extracting and fixing easily lost data, we should fill a form "List of fixing electronic evidence" (Table 1).

Table 1 List of fixing electronic evidence

data	Source	Integrity check value	remarks
\chat record data \chat.txt	From the computer which is running chat program	67ab785b7d4c5a67ab 785b7d4c5a5b7d4c5a	The file of chatting records derived from computer

• Internet gambling crime remote investigation

Remote investigation is mainly used in the gambling website outside. It confirms the site having a betting and gambling function. If possible, it can find gambling amount and personnel information from the member account.[2]

The remote record of investigation or examination includes: Remote object, the purpose of the remote, remote survey and results. In the investigation process, it mainly uses the screen video and screenshots technology e fixing evidence. The principle and method of forensics on internet gambling

• Electronic data examination and identification on internet gambling

Electronic evidence examination refers to the examination of remaining information which has been seized, sealed, fixed storage media. Through the examination, it can find and extract the gambling cases by identifying relevant clues and evidence. Identification mainly draws some conclusions.

During the electronic dada examination and identification, it should devise different tactics according to the object. The principle and method of online opening casinos: Proving the website is internet gambling website and Proof of illegal profit amount, amount of gambling, organized gambling crime. The principle and method of forensics on internet gambling: Gambling website account is the suspect and proof of illegal profit amount, amount of gambling, organized gambling crime.[3]

During the electronic dada examination and identification, first it should get some information, such as internet history, electronic books, chatting records, Email etc. If data was deleted or destroyed, it needs to do data recovery and keywords research. The research keywords can be "wager", "Agent", the research result (Figure 2).

Figure 1 research hits

During the electronic data examination and identification, it can draw the structure of gamblers (Figure 2)

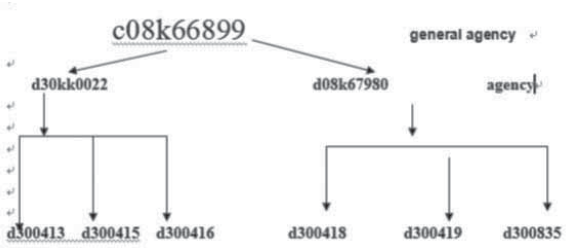

Figure2 the structure of gamblers

2 Mijia. Computer forensics technology [M]. Beijing: the masses press, 2007.

3 YUAN Zhou-bin .Talk about the Investigation Difficulty and Countermeasure of Gambling Crime in Internet[J], Journal of Jiangxi Public Security College:2008.6.

The amount of the wager statistics as shown in figure 3:

Account name	Bet money	Information resource
D300418	14500	utf8 68.html
	5000	utf8 239.html
	5000	utf8 999.html
	5000	\d30kk0022--d300418\utf8 113.html
	33000	\d30kk0022--d300418\utf8 1015.html

Figure 3 the amount of the wager statistics

CONCLUSION

Internet gambling crime is an extension of traditional crime in virtual space. With the development of technology in internet gambling, it is difficult for Public security to fight against this crime. In order to punish crime, the public security organs in charge of investigation must keep pace with the times, grasp the latest means and technology used in crime perpetration, which will result in the healthy and orderly internet development and public security.

REFERENCES

1. Chen Wei. Characteristics and detection strategy of Internet gambling [J]: Journal of Jiangsu Police Officer College: 2009.3.
2. James G. Phillips, Rowan P. Ogeil, Alex Blaszczynski. Electronic Interests and Behaviours Associated with Gambling Problems. International Journal of Mental Health and Addiction. Aug 2012, Vol. 10, No. 4: 585-596.
3. James G. Phillips, Sarah Butt, Alex Blaszczynski. Personality and Self-Reported Use of Mobile Phones for Games. Cyber Psychology & Behavior. Dec 2006, Vol. 9, No. 6: 753-758.
4. Jeffrey L. Derevensky, Rina upta. Internet Gambling Amongst Adolescents: A Growing Concern. International Journal of Mental Health and Addiction. May 2007, Vol. 5, No. 2: 93-101.
5. Mijia. Computer forensics technology [M]. Beijing: the masses press, 2007.
6. Richard A. LaBrie Inside the virtual casino: a prospective longitudinal study of actual Internet casino gambling The European Journal of Public Health August 1, 2008 18: 410-416.
7. Robert T. Wood. Problem gambling on the internet: implications for internet gambling policy in North America New Media & Society June 1, 2007 9: 520-542.
8. YUAN Zhou-bin. Talk about the Investigation Difficulty and Countermeasure of Gambling Crime in Internet[J], Journal of Jiangxi Public Security College:2008.6.

UDC: 004.45:343.98

A HYBRID COMPONENT-SERVICE FRAMEWORK FOR POLICE MATERIAL EVIDENCE IMAGE MANAGEMENT SYSTEM

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Abstract: We explore the requirements of current police material evidence image management system (PMEIMS). Such a critical assessment forms the basis for proposing a unified service component development solution, which integrates the component-based and service-oriented paradigms for supporting the design and implementation of complex PMEIMS. In order to process a large number of images, the PMEIMS becomes more and more complex than ever before. Some new software development approaches should be applied to PMEIMS.

This paper describes a hybrid system development framework, presenting its strengths in PMEIMS. The framework can form the basis for material evidence image management system which represents a new combined approach to PMEIMS development. The rest of this paper is structured as follows: In section 1 we investigate the existing service component frameworks of PMEIMS. In section 2 we discuss the development requirements of future PMEIMS. In section 3 we describe a new service component framework. In section 4, we provide a representative example in order to test the feasibility of CDF. In section 5, summary and conclusion are presented.

Keywords: Component-based Paradigm, Service-oriented Paradigm, Service Component Framework, Integrated Framework, Police Material Evidence Image Management System (PMEIMS).

CURRENT SERVICE COMPONENT FRAMEWORKS FOR PMEIMS

Police material evidence image management system (PMEIMS) is a large and complex information system which can be used to collect, store, manage, retrieve and process various material evidence information (e.g. pictures of crime scene, screenshots of video monitoring, pictures of criminal suspects, etc.). In order to enhance the working efficiency, the PMEIMS needs to be created and updated based on the changing application requirements and environments. Thus, the core of PMEIMS development is to seek a flexible system development approach.

The initial concept of component-based framework was to use pre-existing functions when building brand new IT systems: functions which can also be applied to other systems in the future. The main purpose of the current component-based framework is to disassemble the system into components which can be reused by the rest of the system. The service-oriented computing (SOC) framework utilizes independent services as the basic elements to represent computing in service-oriented architecture (SOA). The core of SOC is service that provides platform-independent, low-cost, evolvable and autonomous computational entities that can be published, described and loosely coupled using standard protocols to develop distributed applications.

According to the features of both component-based and service-oriented frameworks, in this section, we consider two existing component-based and service-oriented composition frameworks which can be used for PMEIMS and illustrate their strengths and limitations with concrete examples.

Service-Oriented Componentization Framework

Li [8] designed a service-oriented componentization framework in Java: in this framework, the term service-oriented componentization means that services are packaged as self-contained and reusable components. Each component contains a group of services; the system functionalities can be provided by these components in PMEIMS.

The purpose of Li's framework [8] is to produce a repository of self-contained components obtained by refactoring/redesigning the critical services extracted from legacy PMEIMSs. The componentization of extracted services is achieved by transforming them into self-contained, deployable components and converting the legacy PMEIMS to a service-oriented componentization development approach.

In order to identify and reuse the services of an existing PMEIMS, the development process of Li's framework [8] consists of two stages: the image service identification stage and the image component generation stage.

Figure 1 depicts the framework.

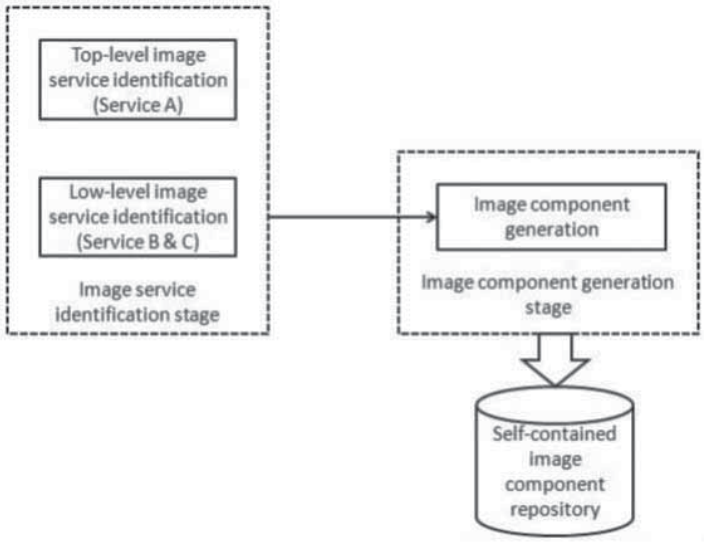

Figure 1 Service-oriented componentization framework

At the image service identification stage, in order to extract the existing PMEIMS into a service-oriented componentization PMEIMS, the image services of the legacy system must be identified so that the system can be rebuilt using those image services. These image services are actually the codes that perform certain PMEIMS functionalities by handling a collection of image data. In the image service identification stage, an image service is defined as an abstract resource that reflects the system functionality (such as message transaction, image data collection or image information sharing).

In order to package extracted image services as reusable image components, they are first categorized into two classes: top-level image services and low-level image services. A top-level image service refers to an individual image service which is not invoked by other image services. A low-level image service can be combined with other low-level image services in order to provide specific system functionalities. For example, in Figure 1, service A can be regarded as a top level image service and services B and C are both low-level image services (in the sense that service B can invoke service C in order to provide specific system functionality).

Furthermore, each image service must be described by a formal description file. Such a file indicates the dependencies and relationships between various image services. Thus, system developers can understand each image service by consulting these description files.

At the image component generation stage, the selected image services are extracted and re-modularized/packaged as reusable and self-contained image components; subsequently these image components can be invoked and deployed independently. In order to manage them, a self-contained image component repository is provided as the output of the image component generation stage.

The main limitation of this framework is the functional decomposition of existing PMEIMSs. This process is referred to as reverse engineering the legacy system in Li's framework [8]. In order to identify useful system functionalities as future services and differentiate them from existing systems, system designers must analyze massive amounts of source code and then provide formal service description files based on various system functionalities. This situation may reduce the reliability of the identified image services.

Another limitation is found in the image service identification stage. This stage requires a person to identify top-level and low-level image services from a number of image service candidates based on the system functionalities and requirements. This process is time consuming and may decrease the efficiency of PMEIMS development.

Composite Framework

Although Li's framework [8] enhances PMEIMS reusability it also reduces the reliability of the system and the efficiency of system development. In order to improve this, Schmidt [7] proposed a composite framework which applied a component-based model to a service-oriented system environment. This framework provides a component-based middleware mechanism which is used to integrate general system services.

In Schmidt's framework [7], the existing service-oriented PMEIMS is accessed by various remote users through the Internet. The system service offers generic functionalities (such as image data management, image data sharing, and error handling) by means of interfaces that manage the behaviours of various applications. Figure 2 illustrates the interfaces and interactions of a system service. The data management interface is used to provide the necessary data and record the status of the service. The communication between different services is handled by the data sharing interface. The error handling interface allows users to monitor the state of the services.

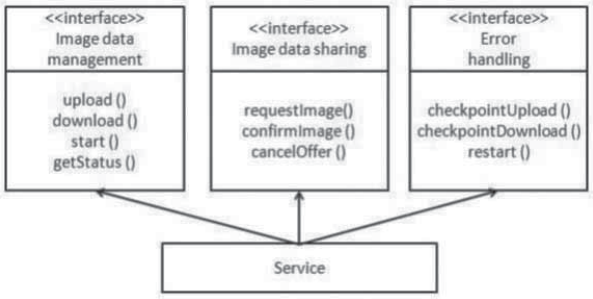

Figure 2 Application service

The purpose of Schmidt's framework [7] is to map component-based applications to services, through the component-based interface solution; thereafter the services are represented as components which can be modified dynamically at execution time. Figure 3 depicts the whole framework.

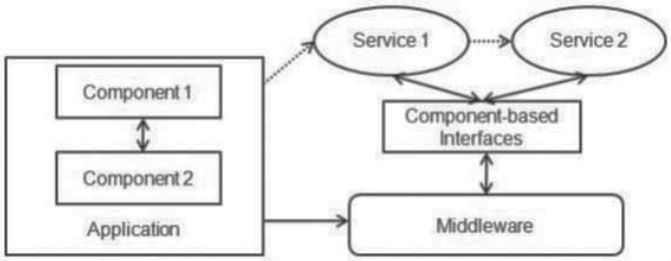

Figure 3 Composite Framework

As portrayed in Figure 3, the middleware solution is designed as a broker between component-based applications and system services. It provides the mechanism to dynamically manage and locate component 1 and component 2 in the component-based application. Therefore, components in the application do not communicate directly with each other, but instead communicate through the middleware. The idea is to reduce the dependencies between various component-based applications in PMEIMS. Service 1 and service 2 communicate with the components in the application through an additional component-based interface. Such an approach enables services to interact with an appropriate component in the application.

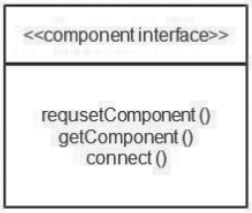

Figure 4 Component-based interface

Figure 4 represents a component-based interface. The component-based interface provides the following methods for mapping components to system services:

- Request component: orders component from the component-based application.
- Get component: receives requested component.
- Connect: maps component to a specific system service.

By adopting the middleware and interface solution, Schmidt's framework [7] provides a communication mechanism between components and services. Thus, the framework can be more easily implemented than Li's framework [8]. However, Schmidt's framework [7] connects components and services in a very simple fashion. The framework only provides a communication mechanism between component-based PMEIMSs and service-oriented PMEIMSs. It does not fully integrate the component-based and service-oriented concepts into one PMEIMS. Thus, it cannot completely exploit the advantages of both component-based and service-oriented paradigms of PMEIMS.

THE DEVELOPMENT REQUIREMENTS OF FUTURE POLICE MATERIAL EVIDENCE IMAGE MANAGEMENT SYSTEM

Police material evidence image management system (PMEIMS) is changing the way of storing and retrieving images. For each grassroots public security agency today, the most important task of developing image management system is to employ an effective information system infrastructure that is able to avoid various human mistakes and inefficient situations. This includes, for example, minimising bureaucracy, reducing numerous manual tasks for police officers, minimising repetition when inserting image information in different applications, shortening transmission times and reducing the amount of adjustments required for applications to work properly. Ideally, a well-designed PMEIMS development framework should be expandable, manageable and reusable depending upon the various requirements and strategies.

PMEIMSs currently play a very important role in every aspect of police material evidence. Such systems offer assistance to every grassroots public security agencies, and must therefore supply information exactly and seamlessly throughout the entire application environment.

In order to enhance the efficiency of image management, today's grassroots public security agencies have to actively seek new system development technologies while existing applications must satisfy the requirements of independently created open systems. These new "open" systems must be based on the following approaches:

- Topology: applications must be able to work in a manageable, reliable, flexible and secure network.
- Evolution: systems must be sufficiently flexible to conform to unstable requirements.
- Platform: software and hardware platforms must be separated.

Unfortunately, the majority of grassroots public security agencies still use many legacy systems to handle crucial daily tasks. Normally, the construction of old systems such as these has been based on certain obsolete paradigms and platforms, and has used various programming models, languages and technologies. Consequently, owing to the current complexity of application environments, these grassroots public security agencies cannot merely modify their IT systems: they must completely replace and update them. Another problem is that most police officers ignore the practical difficulty of renewing an information system. They do not appear to realise that the updating of an information system requires the support of the entire application environment; this is a task which should not be performed by the IT department only.

Based on the above challenges, today's grassroots public security agencies need to seek flexible and reusable IT system paradigms which combine multiple functional and technical abilities to fulfil tasks based on specific business requirements. This becomes the main motivation of current grassroots public security agencies for developing extended image management systems in an ever growing global application environment.

In order to alleviate the challenges of complexity, inflexibility and ever changing application requirements and environments, grassroots public security agencies need to seek a new and more cost-effective approach which can manage and optimise operations and resources; staff members would also need to be provided with their own computers. In comparison with traditional systems, such an approach can:

- Serve more staff and cover wider areas.
- Allow large-scale sharing of image data.
- Create a more cost-effective solution for large-scale image management systems.
- Be more reliable and secure.
- Be more easily deployed and upgraded.
- Supply more computing power.

Current grassroots public security agencies require more flexible image management systems in response to growing application requirements. At the same time, computer applications, image data, resources and application environments are becoming increasingly complex and hence current grassroots public security agencies need to increase the flexibility of their image management systems. Therefore, the most cost-effective solution is to create a flexible and reusable system development framework which can create a platform on which to build efficient and compatible applications and systems in order to fulfil the goals of public security work. As a result, there is a trend towards component-based and service-oriented approaches: the reason for this is that these two methods can provide a better cost-performance ratio than traditional system development solutions.

Through PMEIMS, electronic material evidence images of computer systems can be immediately located by any police officer and protected by sophisticated encryption. The core functionality of PMEIMS is to record and manage a large number of image evidences. The purposes of PMEIMS are listed below:

- Detecting and removing duplicate image data.
- Enhancing the efficiency of image retrieval.
- Decreasing police material evidence image management system updating difficulty.
- Increasing police material evidence image management system compatibility.

According to the features of PMEIMS, we try to provide a new image management system development solution which can fully satisfy the requirements of future PMEIMS. In today's IT industry, component-based and service-oriented paradigms are the most two popular management system development approaches, thus we can try to combine the features of them, and create a hybrid service component framework for PMEIMS.

There are many advantages in adopting component-based and service-oriented paradigms for PMEIMSs. These include: reducing system development costs, enhancing application design efficiency, and shortening the duration of system development. In order to provide further benefits for PMEIMS and fulfil development goals, reusing and restructuring existing system components and services have become major concerns in this paper. Based on the features of component-based and service-oriented paradigms, we attempt to search for a component and service composition method. Such method focuses on enhancing the flexibility and reusability of current component-based and service-oriented PMEIMS.

Based on such hybrid framework, the future PMEIMS will possess the following characteristics:

- Resource sharing: The future PMEIMS will share computer devices and the data of multiple users without being limited by position and distance.
- Extensibility: The future PMEIMS will easily add and remove components from the existing system.
- Transparency: The future PMEIMS will provide a uniform and integrated unit for all users, and all unnecessary system-dependent information (such as the interactions between components or the location of the server) will be hidden.
- Concurrency: Multiple access activities will be synchronised in order to avoid various data transformation errors.
- Failure handling: The future PMEIMS will provide proper error-handling mechanisms (such as system recovery and hardware redundancy) in order to ensure reliability and maintainability.

This hybrid solution relies on components and services as its fundamental building blocks and takes advantage of the features offered by both the component-based and service-oriented approaches. The goal of such framework is to simplify the development process of future PMEIMS in dynamic application environments.

A HYBRID SERVICE COMPONENT FRAMEWORK FOR POLICE MATERIAL EVIDENCE IMAGE MANAGEMENT SYSTEM

In this section, we design a hybrid component-based and service-oriented composition framework which can be used for the development of PMEIMS. We named this development approach as Component-service Deployment Framework (CDF).

Component-service Deployment Framework

Today, many PMEIMSs are still the mixture of legacy technologies and new application platforms. To satisfy the development requirements of such systems, we try to design a component-service deployment framework (CDF). In our framework, the services are provided by the integration of software components.

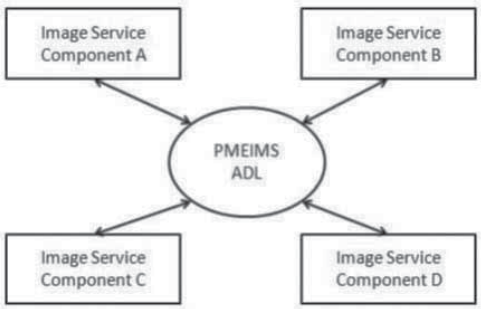

Figure 5 Component-service deployment framework

The core of CDF (see Figure 5) is the image service component. An image service component integrates the component-based and service-oriented concepts and reflects system functionality. It modularizes service-oriented applications and packages the relevant service messages and functionalities. Based on the features of both component-based and service-oriented paradigms, the image service component can be extended, customised and specialised in our framework. The modularisation of image service is essential in the framework and the steps to achieve this are listed below:

- Image service identification: in order to modularise the service-oriented application, the relevant image services must be extracted from the application.
- Image service description: the characteristics (such as functionality, relationship and interaction) of the image services should be described in detail.
- Image service modelling: the composite image service components are developed with a focus on the requirements. This step defines how the image service components can be created and reflects the processes of the image service modularisation.

As depicted in Figure 5, image service component A communicates with other image service components (B, C or D) in the system through a PMEIMS ADL (Architecture Description Language) file. The PMEIMS ADL file is an XML-based file that describes the relationships between various image service components. The structure of a PMEIMS ADL file should follow the format provided as an example in Figure 6 below.

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <CDF:composite>
3
4    <!-- The service offered by the PMEIMS application -->
5    <!-- Offered via an EJB binding -->
6    <CDF:service name="PMEIMS_Service promote="ComponentA">
7      <CDF:interface.java interface="com.CDF.PMEIMS"/>
8      <CDF:binding.ejb url="corbaname:fz:PMEIMS_Host:1000# ejb/PMEIMS_Home"
9        homeInterface="com.CDF.PMEIMS_Home"/>
10   </CDF:service>
```

Figure 6 Example of a PMEIMS ADL file

The PMEIMS ADL file exposes well-defined communication protocols that describe the necessary operations of the image service components. Through the PMEIMS ADL file, an image service component can be published, discovered, and invoked just like any traditional component. Thus, various image service components can work together in order to fulfil a specific system requirements.

Our framework can provide the ability to manage, reuse, and customise the image service components. An image service component can be deleted or changed dynamically, and does not affect the functionalities of any other image service component. However, the ADL file specifies the interactions of all service components in PMEIMS. If a specific image service component needs to be modified or removed because of certain requirements, the PMEIMS ADL file has to be re-specified and redeveloped in order to provide suitable communication protocols. This situation results in cluttered and unmanageable communication problems.

IMPLEMENTATION OF CDF

The above discussion attempts to create a unified framework for PMEIMS. The best way to test the feasibility of a CDF is to investigate a representative example. The purpose of this example is to illustrate the source codes of the main elements in CDF, and to provide a basic understanding of the CDF concept for PMEIMS architects and developers. This example creates a CDF-based component implementation that provides an image service. In this section, Java was chosen as the main implementation programming language.

Based on the CDF development method, the following steps will demonstrate:

- Building an image information service in Java language.
- Building a CDF-based component which implements the image information service based on a CDF development approach.

In the first step, an ImageInfoService is created. It provides an ImageInfoService interface, and allows customers to search the image information. Figure 7 represents the ImageInfoService interface in Java. It includes one method: getImage. Based on the user identification, the value will be returned to the relevant object.

```
1 package service.image;
2 piblic interface ImageInfoService {
3  Image getImage(String imageID);
4 }
```

Figure 7 ImageInfoService Java interface

Figure 8 demonstrates the ImageInfo class:

```
1  package service.image;
2  piblic class ImageInfo {
3   private String imageNumber;
4   public String getImageNumber() {
5   ·····return imageNumber;
6   }
7   public void setImageNumber(String imageNumber){
8   ··this.imageNumber=imageNumber;
9   }
10 }
```

Figure 8 ImageInfo class

Figure 9 represents the ImageInfoImpl implementation class in Java. This class implements the ImageInfoService interface and the ImageInfo class based on the CDF concept.

```
1 package service.image;
2 piblic class ImageInfoImpl implements ImageInfoService {
3
4  public ImageInfo getImageNum(String imageID) {
5  ····ImageInfo imaNun = new imaNum();
6  ····imaNun.setImageNum(imageID+"_"+"00000");
7  ····return imaNun;
8   }
9 }
```

Figure 9 ImageInfoImpl class

In the second step, a CDF-based component is created (see Figure 10). In the CDF, the CDF-based component is used to implement services and thus the ImageInfoImpl class is nested in the ImageInfoComponent.0.

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <component name="ImageInfoComponent">
3  <implementation.java name="service.image.ImageInfoImpl"/>
4 </component>
```

Figure 10 ImageInfoComponent

As discussed in this section, by developing an image information service and a CDF-based component, the CDF-based PMEIMS example demonstrates the implementation process of the CDF development approach.

SUMMARY, CONCLUSION AND FUTURE WORK

By investigating the requirements of PMEIMS, this study provides a framework called component-service deployment framework (CDF), with the goal of compensating for the limitations of current management system development paradigms.

Component-service deployment framework is a novel system development paradigm that combines the reusability of CBSD and the flexibility of SOA. Reusable SCSD-based components reduce costs, shorten development time, and improve service quality when implemented effectively. The component-service deployment framework offers an alternative to older PMEIMS development approaches, and provides a new solution which establishes a relationship between services and components for current enterprise systems. However, the above composition method is not only way to combine existing system functions into new solutions. There are some other methods can achieve information composition also, such as modularization the whole existing application as a single service-component. Thus, the new methods of integration existing applications need to be investigated in future.

REFERENCE

1. Jay Goyal & Vice President. 2006. Challenges to enterprise systems manufacturers: delivering flexibility, managing complexity, and providing optimal service. California: Oracle.
2. Kenneth P. Birman. 2005. Reliable distributed Systems: technologies, Web services, and applications. New York: Springer.
3. Michael Bell. 2008. Service-oriented modelling: service analysis, design, and architecture. New Jersey: John Wiley & Sons.
4. Mark Little, Thomas Erl, Arnaud Simon & Thomas Rischbeck. 2009. Modern SOA infrastructure: technology, design, and governance. New Jersey: Prentice Hall.
5. Nestor Riba & Humberto Cervantes. 2008. A MDA tool for the development of service-oriented component-based applications. Universidad Autonoma Metropolitana-Iztapalapa.
6. Papazoglou MP., Traverso P, Dustdar S & Leymann F. 2007. Service-oriented computing: state of the art and research challenges. Washington: IEEE Computer Society.
7. Rainer Schmidt, Siegfried Benkner, Ivona Brandic & Gerhard Engelbrecht. 2005. Component-based applications programming within a service-oriented grid environment. Atlanta, USA.
8. Shimin Li. 2006. A Service-Oriented Componentization Framework for Java Software Systems. M.Sc. dissertation University of Waterloo.
9. Spinellis D & Gousios G. 2009. Beautiful architecture: leading thinkers reveal the hidden beauty in software design. Sebastopol: O'Reilly Media.
10. Thomas Erl. 2007. SOA principles of service design. New Jersey: Prentice Hall.
11. White WJ, Gallaher MP, Bingham TH & Kropp B. 2002. Benefits and costs of ATP investments in component-based software. Gaithersburg: NIST.
12. William J White, Michael P. Gallaher. 2007. Benefits and costs of ATP investments in component-based software. USA: NIST.

UDC: 343.982:656.1.08

STUDY ON THE CHARACTERISTICS OF AUTOMOBILE TIRE TRACES WITH ABS

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Abstract: Based on the fitted features and advantages with anti-lock braking system (ABS), the article shows the characteristics of auto tire trace with ABS from the vehicle braking traces boundary conditions (slip rate, adhesion coefficient, ground pressure, tire properties and other factors), tire braking traces, tire skid marks and so on. Comparing the differences between automobile tire traces with or without ABS, the article will prepare the further study on ABS tire traces for the future. It will have practical guiding significance in the practice of public security work.

Keywords: automobile; anti-lock braking system; tire trace; ABS

INTRODUCTION

With the rapid development of automobile industry and the rapid outspread of road traffic, the vehicle safety requirements are also getting higher and higher. To improve vehicle braking performance is always the important task of automobile design and the manufacturing sector. Anti-lock braking system (ABS) will not lock the auto wheels. The most important function of ABS is not only to shorten the braking distance, but also to keep the vehicle braking direction stability. It plays an important role in the vehicle driving safety. Anti-lock braking system is successful in a car development; so the automotive braking performance has been a qualitative development.

At present, the ABS function is more perfect and its reliability has gradually increased. So this will promote the extensive application of ABS-equipped auto. Since 1995, the ratio of cars equipped with ABS in America, Germany and Japan equipped was 55%, 50% and 35% respectively; and for the trucks it was 50%, 50% and 45% respectively. China's study of ABS began in the 80's and has embarked on the development of vehicle safety regulations now. In China heavy trucks and buses were first equipped with ABS. The automotive industry is developing rapidly today, the number of cars is increasing and the ratio of automobiles equipped with ABS is quite large, so this means that the number of ABS-equipped automobile accidents will increase year by year and the traffic accident investigators are faced with new problems.

AUTOMOBILE TIRE TRACES WITH ABS

ABS is known as the anti-lock braking system. It is the English abbreviation of Anti-lock Brake System. ABS is one of the components of automobile brake system. It can effectively control the wheels in the motion state during the braking process of the automobile. So the longitudinal adhesion coefficient of wheels can be a peak. At the same time its lateral also maintains the high attachment coefficient. As a result the automobile's anti sliding ability is good and it has the shortest braking distance. It improves the driving safety of the automobile.

When anti-lock braking system works, there is rolling friction between the wheels and the road surface friction which can make full use of the wheels and the road between the maximum adhesion braking. Thereby it improves the braking deceleration, shortens the braking distance, and the most important thing is that it ensures the stability of automobile direction. A typical ABS is composed of an ECU (Electronic Control Unit), four speed and wheel sensors (VSS and WSS), a pump, and two or more hydraulic valves on the brake circuit. The ECU constantly monitors the rotation speed of each wheel. ABS is equivalent to a very high frequency spot brake, so in case of emergency the brake pedal will feel in fibrillation; also what can be heard during braking is that general pump sends the "Da Da" sound, which is ABS in normal work. Because the brake master pump continuously adjusts the brake pressure on the brake pedal, the brake pedal will have continuous feedback force. Therefore, in this case, the driver must press the brake pedal constantly and take active mea-

sures. The system can automatically control and regulate wheel braking force in the automobile braking process, prevent the brake wheel lock, maintain the largest wheel adhesion coefficient and improve the car's overall handling and stability. So, the auto can obtain the optimum braking effect, namely the short braking distance, minimum lateral slip and the best steering brake performance.

Comparing ABS and conventional brake systems, ABS has the following characteristics:

a) Improved braking efficiency. ABS can make full use of the vertical peak ground adhesion coefficient and larger lateral adhesion coefficient, so that the wheel and the ground get the maximum braking force, shortening the braking distance.

b) Improved vehicle braking performance of steering. If the front wheel is slipping when automobile is braking, the car loses steering ability and only runs by the inertia force in the direction of operation. Automobile will not avoid pedestrians and obstacles. ABS can prevent the wheel from sliding.

c) Improved lateral stability of automobile brake. If the wheels is locking, adhesion coefficient (also known as lateral adhesion coefficient) is very small and auto will slip easily. So ABS sliding rate is between 10% and 25%, adhesion coefficient is bigger, it will have enough to resist lateral interference capability.

d) Reduced local tire wear. Auto lock slip will cause local tire wear, shortening the service life of tire. ABS can prevent the occurrence of such a situation.

e) Reduced labor intensity of the driver. ABS makes the passenger ride comfort and safety.

THE CHARACTERISTICS OF AUTOMOBILE TIRE TRACES WITH ABS

The car equipped with ABS leaves the braking traces as the press mark, which is formed by the principle of ABS control decision. ABS essentially controls the degree of wheel slippage during braking. When wheel slippage is zero, the braking trace is the roll trace. When the wheel slippage is 100%, it is the drag trace. When auto is in the emergency braking, ABS will be activated and make the wheels slippage maintain within 15% - 20% range relative. The braking traces must be a press mark. In the experiment, when the auto is in the emergency brake, the wheel is always in the rolling and sliding condition. The structure image braking trace was line shape, and the deformation of tire tread profile can be showed. These press marks are typical features of ABS braking. They are shown in Figure 1.

Figure 1 - The ABS-equipped automobile tire braking traces - press mark

Theoretically there is significant difference between the ABS-equipped automobile braking trace and common automobile braking trace. In general, the ABS-equipped automobile brakes does not leave clear drag trace. Because of the emergency brake, ABS will play a role and it will make the wheel slip rate maintain within 15% - 20% range. Then the wheel is at the side edge of rolling and slippery condition. But the theoretical analysis and experimental results are not fully consistent. In 1980, the BOSCH ABS tests in France showed that it generally had slight drag braking traces. While the BOSCH ABS tests in Germany concluded that only half of the trials had drag trace, and pointed out that the drag trace shape is related to the size of the pedal force. If the pedal force increases and

is in direct interaction with ABS, the color of drag trace is light or heavy which is like a broken line. Recently the Toyota Desert King ABS test results proved the same as the earlier results of BOSCH ABS test in the United States. It said that ABS braking trace generated weak braking traces, the start point and the end point were not easy to judge, and it did not break the underlined phenomenon. In addition, some tests show that the heavy braking traces appeared in the rugged road. From an external feature, the rugged road surface makes the ABS failure forming instantaneous tire drags trace. Sometimes the pedal force is too strong that it will cause instantaneous ABS loss, so that tire transient lock and generate short black drag traces which are generally more than one meter long. It is shown in Figure 2.

Figure 2 - The ABS-equipped automobile tire braking traces - drag trace

ABS-equipped automobile braking traces easily disappear, because the air dust and other particles will stick on the surface of traces due to gravity and under the action of external forces. It makes the traces obscure. So light ABS traces will become blurred mask coupled with the dust particles. Field test results: the ABS trace formed after 20 minutes, the starting point has become blurred. In the dusty air or windy weather, the road tire marks may soon disappear. The external characteristics of ABS-equipped automobile braking traces are mainly graphic layer reduction traces; therefore, the braking trace is relatively light and discontinuous. It is shown in Figure 3. ABS braking trace inspection method is basically the same with general braking trace. The effective method is observed in low angle, side surface and photographed by camera in the same way.

Figure 3 - The ABS-equipped automobile tire braking trace is light and discontinuous

The difference of automobile braking distance is significant with ABS and without ABS. The stability of the differences is related to the vehicle types, vehicle, road conditions, vehicle speed and other factors. Studies show that the average difference of a truck braking distance is 2.5%; the average difference of a car is about l0%. ABS-equipped automobile braking trace is mainly flat minus layer trace. It always shows press marks or drag traces when braking and sideslip trace when steering braking. When ABS-equipped automobile sideslips, the tire sideslip traces show heavy on the outside and light on the inside. When ABS-unequipped automobile sideslips, the sideslip traces show heavy on the inside and light on the outside. The contrast is very strong in the test between

both, as shown in Figure 4 and Figure 5. In addition, the density of all traces is similar. As the figures show, ABS-equipped automobile trace distance remained unchanged (laterally separated) because of automobile steering, but its curve mutation will display the steering operation. Tire sideslip trace width remained unchanged or essentially unchanged and the tire tread shape is parallel to tire marks. These pieces of information can determine the vehicle type and direction of travel in traffic accidents, especially in hit-and-run accidents.

Figure 4 - The ABS-unequipped automobile tire sideslip trace

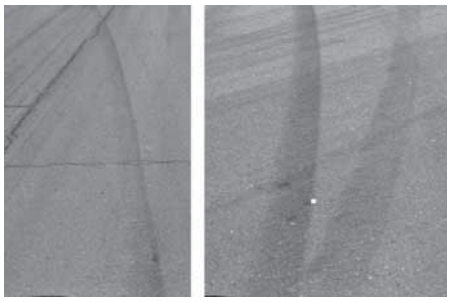

Figure 5 - The ABS-equipped automobile tire sideslip trace

CONCLUSION

Through the ABS study, the article recognizes ABS-equipped automobile tire braking traces have distinctive characteristics, namely tire marks are press marks, drag trace, light and discontinuous, easy to disappear. The braking efficiency and direction stability of automobile with ABS have been greatly improved. The characteristics of automobile sideslip traces with ABS can infer the vehicle type, direction of travel, travel speed, determine the main reason of a traffic accident, and verify the authenticity of testimony and other evidence. Using image processing technology of ABS tire traces has guiding significance on the practice of public security work. It will cause ABS malfunction because of road surface state and the driver braking operation in different ways, such cases are likely to occur in traffic accidents. Therefore, the vehicle equipped with ABS reduces the risk of accidents, although it is not possible to completely avoid the occurrence of traffic accidents.

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REFERENCES

1. Tangang Hou. The application and development of ABS in auto [J]. Information of science and technology, 2007
2. Huaixuan Xie, Qianxiong Wang. Structure, principle and maintenance of the anti-lock braking system [M]. China Communications Press, 1999
3. Jian Song, Yong Li. Automobile anti-lock braking system control method research of [J]. Technology of highway and transport, 2002, 12
4. Jun Cheng. Theory and practice of the anti-lock braking system [M]. Beijing Institute of Technology press, 1999
5. Han-xin ZHANG, Hui-yong ZHANG. Derivative theory and prevention study of secondary accident [C], The 11th International Conference of Chinese Transportation Professionals, 2011, 2481-2489.
6. Han-xin ZHANG, Hong-guo XU, Li-dong TAN. Trace Analysis and Identification on Un-motor Vehicle Driving State in Traffic Accident [C], The 2nd IEEE International Conference on Advanced Computer Control, 2010 (1):329-332.

UDC: 343.983:662.2/.4

THE CHARACTERISTICS OF FRAGMENTS OF IMPROVISED EXPLOSIVE DEVICES

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Abstract: In this paper the characteristics of fragments of improvised explosive devices(IEDs) were the first time studied by explosive experiment in China. The typical IEDs including timing IEDs, remote-controlled IEDs, victim-operated IEDs were researched. The weight of TNT used in this explosive experiment is 150g. The IDE was detonated by electric detonator in a special container made by steel plate. The fragments of IEDs were collected by hand and griddle. The experimental result indicated that the fragments of improvised explosive devices were very small, the surface of fragments had smoke-discoloured and the characteristic of bead. The characteristics of fragments of IEDs including materials, shape, colour, size, etc.can be used to reconstruct IEDs. Bomber's signature can be acquired by the IED construction materials and fabrication techniques.

Keywords: IEDs, fragments of IEDs, explosive experiment

INTRODUCTION

An improvised explosive device (IED) is a homemade bomb constructed and deployed in ways other than in military action. It may be constructed of conventional explosives attached to a detonating mechanism. IEDs are extremely diverse in design, and may contain many types of initiators, detonators, penetrators and explosive loads. Antipersonnel IEDs typically also contain fragmentation-generating objects such as nails, ball bearings or even small rocks to cause wounds at greater distances than blast-pressure alone could. IEDs are triggered by various methods, including remote control, infra-red or magnetic triggers, pressure-sensitive bars or trip wires (victim-operated).The sophistication of an IED depends on the training of the designer and the tools and materials available.

Currently IEDs used by criminals are diversified and intelligent in China. The typical IEDs were summarized according to hundreds of explosion cases happened in China recent years. The typical IEDs including timing IEDs, remote-controlled IEDs, victim-operated IEDs, multi-control device and so on has been researched. The models of the typical IEDs were made in laboratory(Figure 1, Figure 2). The parts of the typical IEDs were purchased in market and assembled according to the principles ofthe typical IEDs, the electric detonator was substituted by buzzer in the model. When the model of the devices worked, buzzer would alarm. The feasibility and reliability of the typical IEDs were tested. About two hundred models were made. The principles of IEDs were demonstrated by the models.The method of disposal of such explosive devices wasacquired according to the model of the typical IEDs, which can be helpful to counter terrorism.

The IEDs would be broken because of the blast effect of dynamite. It is a very important and complicated work to identify the fragments remains of IEDs. Knowledge of the builder, ingenuity of the builder and skill of the builder can be acquired by the reconstruction of IED. Bomb scene investigator must be acquainted with the characteristics of fragments which can help investigator find fragments quickly in the explosion scene. The original of fragments of IEDs can be deduced according to the characteristics. In this paper the characteristics of fragments of IEDs were for the first time studied by explosive experiment in China. The typical IEDs including timing IEDs, remote-controlled IEDs, victim-operated IEDs were selected. The weight of TNT used in this explosive experiment is 150g. The IED was detonated by electric detonator in a special container made by steel plate. The fragments of IEDs were collected by hand and griddle. The experimental result indicate that the characteristics of IEDs' fragments, including materials, shape, colour, size, etc.,can be used to reconstruct IEDs.

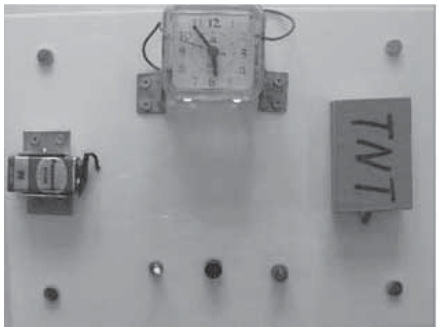

Figure 1: The model of timing IEDs

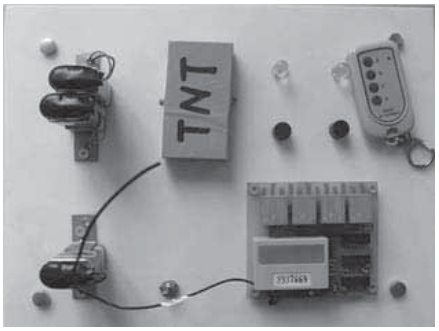

Figure 2: The model of remote-controlled IEDs

EXPERIMENTAL METHOD

The parts of typical IEDs including blastingfuse, electric detonator, tension exploder, quartz clock, washing machine timer, microswitch, car alarms, metal can, wood box, ceramic and so on were purchased on market.The explosive is TNT whose weight is 150g. Blasting machine was used to detonate electric detonator. The IED was put in the special container made by steel plate (Figure 3), and all the fragments should be in the special container after IDEs blasted.

The parts of typical IEDs were put around TNT closely. The TNT was detonated by electric detonator. The fragments of IEDs were collected by hand and griddle. The explosive experiments were carried out three times on the same experimental condition. The characteristics of IEDs' fragments compared with their original can be discovered, the fragments can be identified by these characteristics.

Figure 3: Container made by steel plate

RESULTS&DISCUSSION

An IED has five components: a switch, an initiator, container, explosive, and a power source. The parts of IED would be fragments except explosive after IED was detonated in explosion scene. The characteristics of fragments of IEDs were related to material, explosive charge, distance, etc. The experimental result indicated that the fragments of improvised explosive devices were very small, the surface of fragments is smoke-discoloured and the characteristic of bead. Crime scene investigator can find fragments quickly by these characteristics in the explosion scene and reconstruct the IEDs fast.

THE CHARACTERISTICS OF CONTAINER FRAGMENTS

The reasons containers are used include the following: for concealing the IED; in conjunction with concealment, as a means of transporting or shipping the IED from one point to another. Metal can, wood box, bag, glass,ceramic, plastics were usually used as container of IEDs in China. The experimental result indicated that the edge ofmetal deformation fragments is thinner and sharp seriously (Figure 4). The brand name is clearly visible, which would aid in its identification with a possible source. The plastics fragments are melting, The fragments of container were smoke-discoloured on one side, the other side had no trace (Figure 5). Wood fiber of fragments is recognized (Figure 6), these fragments can be distinguished by its material. The original can be deduced through the characteristics of these fragments.

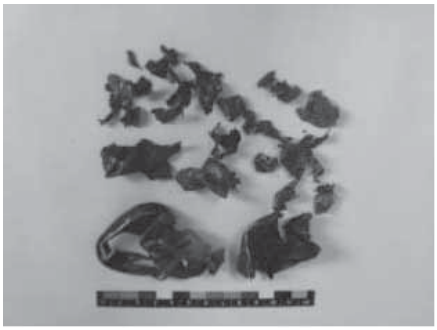

Figure 4: Metal deformation fragments

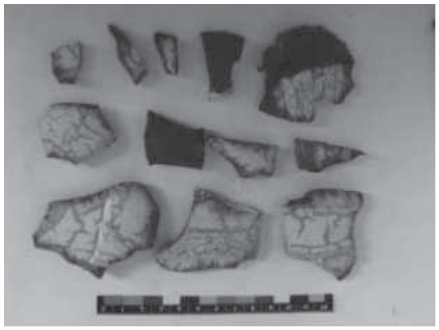

Figure 5: Ceramic fragments

Figure 6: Wood fragments

THE CHARACTERISTICS OF INITIATOR FRAGMENTS

Safetyfuse, electric detonator, tension exploderwere usually used as initiator in China. Safetyfuse burns internally and does not consume itself. The fragment of safetyfusecan be identified by its appearance(Figure 7), if appearance cannotbe recognized, the Kraftpaper with trace of kinking and pitch can be used as characteristic of blastingfuse (Figure 8). Electric detonator fragments are too small to identify, but the closure plug, wires and some internal components remained are easy to recognize (Figure 9). The characteristics of tension exploder fragments, including igniter capsule, ironwire,is easy to identify (Figure 10). The original can be deduced through the characteristics of these fragments.

Figure 7:Blastingfuse fragment

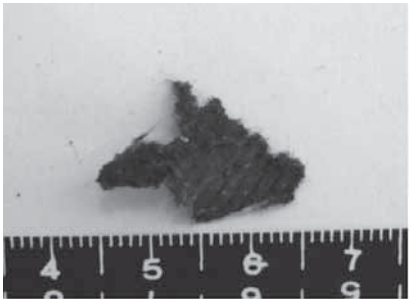

Figure 8: Blastingfuse fragment

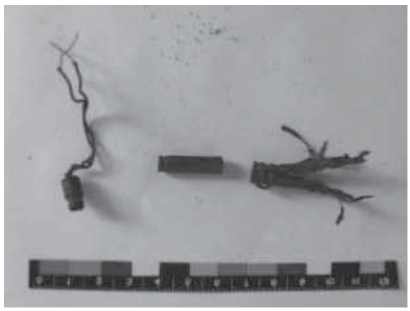

Figure 9: Electric detonator fragments

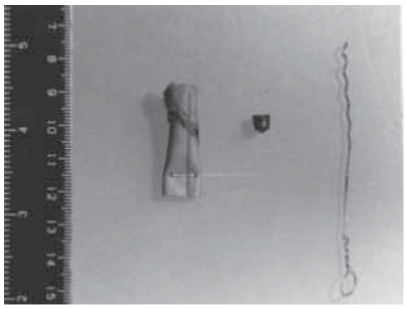

Figure 10: Tension exploder fragments

THE CHARACTERISTICS OF SWITCH FRAGMENTS

Switches are the largest single group of components, both commercially manufactured and improvised, that are used in the construction of an IED. Regardless of how simple or elaborate it is, a switch used in an IED is intended to perform one function ultimately –allow electrical energy to flow from the power source to the initiator to initiate IED. Switches are either mechanical or electric in the operation.

Of the numerous methods used to initiate IEDs, time delay is one of the most common. The use of a time delay provides a period of time from the placement of a bomb until it explodes, enabling the person who placed the device to leave the area. Quartz clock, washing machine timers were used usually in the timing IEDs in China, the fragments were difficult to identify. The characteristics of fragments of the quartz clock are ring sheet metal and plastic gears (Figure 11). The characteristics of fragments of washing machine timer are the clockwork fragments (Figure 12).

A remote-controlled IED is initiated by bomber at a time of his or her choosing. Components and techniques utilized in the construction of command-initiated fusing systems can vary from the extremely complex to the absurdly simple. Car alarmswere used usually in remotely control IEDs in China, the characteristics of fragments of car alarm including circuit board fragments(Figure 13), capacitor, relay, enamelledwire (Figure 14) are easy to identify.

Figure 11:Quartz clock fragments

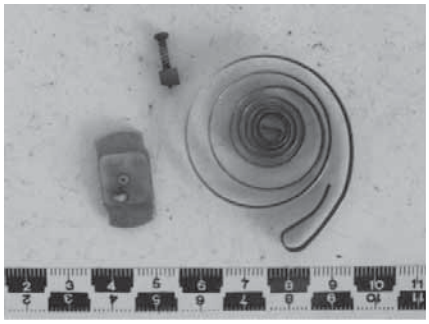

Figure 12: Washing machine fragment

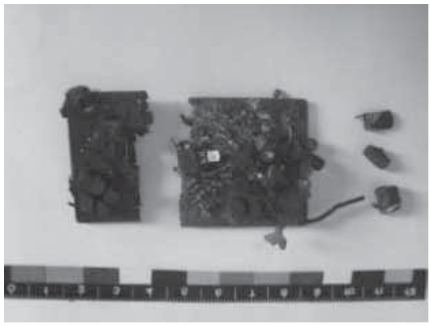

Figure 13: Car alarm fragments

Figure 14:Enamelledwire fragments

Victim-operated IDEs wait for the victim to do something to them or around them, which activates the device. These type of IEDs do not explode on their own like the timing IEDs. Simple switches include various types of micro-switches, and mercury switch were used usually in-victim-operatedIDEs in China. The characteristics of fragments of micro-switch were the metal fragments(Figure 15) in all shapes. The glass fragment with two short wires was thecharacteristics of mercury switch fragments (Figure 16).

Figure 15: Micro-switchfragments

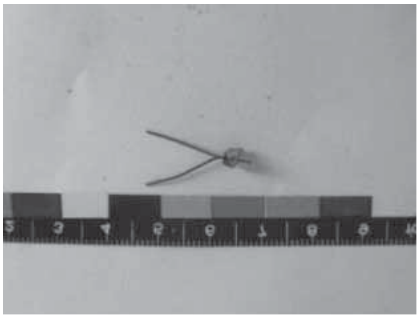

Figure 16: Mercury switch fragments

THE CHARACTERISTICS OF POWER SOURCE FRAGMENTS

A battery is an essential component of an IED as the source of electrical power to an electrical fusing system. The most common type of battery used in construction is a dry cell battery, which consists of a metal casing, an electrode in the centre of the case, and an electrolyte, which is a deep black paste or powder with other minor components. The outside of the battery is normally made of a thin sheet of metal or plastic film covering the metal and exhibits battery identification information regarding the manufacture, brand and type of battery, voltage, model number, expiration date, and whose ends are positive and negative. Alkaline, carbon-zinc batteries, storage battery, were used as power source in IEDs in China. Alkaline and carbon-zinc batteries were identified by their appearance (Figure 17), lead fragments were the characteristic of storage battery (Figure 18).

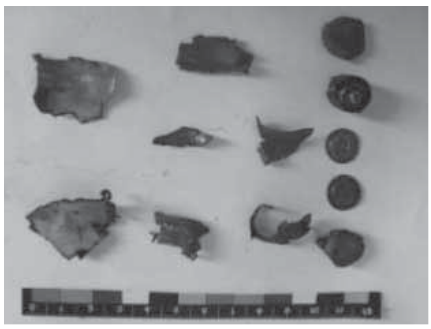

Figure 17: Carbon-zinc batteries fragments

Figure 18: Storage battery fragments

CONCLUSION

The experimental results indicate that the fragments of switch, initiator, container, and power source have their characteristics including materials, shape, colour, size, etc. Originals of fragments can be deduced and the IED can be reconstructed correctly by these characteristics. Bomber's signature can be acquired by the IED construction materials and fabrication techniques. This is the first time to study the fragments of IDEs by explosive experiment. In the future, other explosive, charge and more IEDs will be selected in experiment. The sample chamber of fragments of IEDs will be established in China.

ACKNOWLEDEGEMENT

I would like to thank Professor Yanchun Zhang who provided assistance by arranging the experiment. I am also thankful toLihong Chen and Lei Zhang who assisted me in recovering and photographing the fragmented remains of IEDs. I would particularly like to thank Shenyang Dongji Industries Group Corporation which provided explosive (TNT) and the site for explosive experiment.

REFERENCES

1. Hongguo Z, Yanchun Z. Research on Improvised Explosive Device. 19th Meeting of the International Association of Forensic Science, Madeira, 2011.
2. James T. Thurman. Practical Bomb Scene Investigation, New York, 2011.
3. Guoan Li. Countermeasures Tutorial of Explosion Crime, Beijing, 1998.

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EXPERIMENTAL STUDY ON A FORENSIC SEMI-AUTOMATIC SPEAKER VERIFICATION USING VOWEL CEPSTRAL WITH LIMITED QUESTIONED DATA[1]

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Abstract: This study tests the discriminant performance of a forensic semi-automatic speaker verification system within likelihood ratio (LR) framework using limited data of questioned voices. Vowel tokens of /a/ from 42 speakers in the database of standard Chinese recorded in different sessions was selected for this test. Vowel cepstral coefficients were modeled using both the multivariate kernel-density (MVKD) and Gaussian mixture model (GMM) separately. Vowel cepstral coefficients from cross-validated comparisons of each same-speaker pair and different-speaker pair were used to calculate LRs. The accuracy of the system was measured using the log-likelihood-ratio-cost function (C_{llr}). Results indicate that GMM model outperforms MVK model by showing better discriminant performance and accuracy for this task. Therefore, GMM is proposed to model vowel cepstral coefficients for limited questioned data.

Keywords: forensic speaker identification; likelihood ratio; limited questioned data; vowel cepstral; GMM

INTRODUCTION

The application of the Beyes approach is established as a theoretical framework for any forensic discipline [1]. The interpretation of the strength of forensic evidence using likelihood ratios has been recommended by many forensic statisticians and forensic scientists [2-7]. According to Morrison (2009), "we are in the midst of a paradigm shift in the forensic comparison sciences and the new paradigm can be characterized as quantitative data-based implementation of the LR framework with quantitative evaluation of the reliability of results" [8]. The new paradigm was initially and successfully used in DNA comparison in the mid-1990s, and is gradually spreading to other branches of forensic science, such as speech, fingerprint, handwriting, glass evidence, etc. In forensic investigations involved with speech evidence the questioned recording provided to the forensic speech expert is usually short and sometimes contains only a few words. This is unavoidable in forensic speaker recognition cases and what you can do is just use the limited data, as much as you can. In forensic speaker recognition two kinds of systems are often used within LR framework to evaluate the strength of speech evidence. One is the forensic fully automatic speaker verification system which deals with the speech signal as a whole. The state of art technique used in these fully automatic systems are Gaussian mixture model-universal background model (GMM-UBM) [9-11] proposed by D. A. Reynolds. However, the disadvantage of this model is the performance of system that can be degraded when speech samples are involved with noise, varied transmission channel and limited speech duration. It is hard to give a reliable verification result using fully automatic speaker verification systems when only a single short recording is provided. The other one is the forensic semi-automatic verification system, in which the desired vowels (monophthongs, diphthongs or triphthongs) are labeled manually by the operator and the speech features are usually extracted manually or semi-automatically. The common features used in forensic semi-automatic

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verification systems are fundamental frequency (pitch) values, pitch curves, formant central frequency [12] [13] and coefficient values from discrete cosine transforms fitted to formant trajectories [14]. This semi-automatic verification system is a better choice for conditions when the questioned voice is very short and only very limited data can be used. This is because that vowel tokens can be analyzed one by one to get speakers' individual information as much as possible, but the time and labor costs are huge.

In this paper the forensic semi-automatic speaker verification system with automatic parameters of manually selected vowel tokens was used to evaluate the strength of limited speech evidence within the LR framework. It should be noted that the aim of this study is to see how much evidence strength the system can provide and what performance can be achieved under the condition of very limited questioned data. This does not mean that limited questioned data are enough for evidence evaluation in real forensic practice. In addition, LRs are calculated using both GMM and MVKD separately with vowel cepstral coefficients. The performance of the system using two sets of LRs from GMM and MVKD are compared. Finally, the fusion of the results from all tokens used is also discussed.

INTERPRETATION FRAMEWORK OF THE EVIDENCE

In forensic investigation forensic experts have to interpret and evaluate the strength of the evidence even it is very limited (it is often impossible to obtain additional questioned recordings). Beyes theorem is the current state-of-the-art interpretation of forensic evidence and the framework of likelihood ratios is the main concern of forensic scientists [15]. LR framework does not force the forensic expert to make "yes" or "no" decisions, which is posterior odd (probability) and should be devolved upon the court. In the Bayes theorem forensic scientists provide the strength of evidence (likelihood ratios) which supports either prosecution hypothesis (H_0) or defence hypothesis (H_1), which is combined with prior background knowledge (prior odds, province of the court) to give posterior odds (province of the court) for judicial outcomes or issues [16]. It allows for revision based on the present evidence of the measure of uncertainty (LR, province of the forensic scientist) which is applied to the pair of two competing hypothesis: H_0 and H_1. The Beyes theorem is shown in Eq. (1).

H_0 – the two recordings were spoken by the same speaker.

H_1 – the two recordings were spoken by two different speakers.

$$\underbrace{\frac{p(H_0|E)}{p(H_1|E)}}_{\substack{\text{posterior odds}\\ \text{(province of}\\ \text{the court)}}} = \underbrace{\frac{p(E|H_0)}{p(E|H_1)}}_{\substack{\text{likelihood ratio}\\ \text{(province of}\\ \text{the scientist)}}} \times \underbrace{\frac{p(H_0)}{P(H_1)}}_{\substack{\text{prior odds}\\ \text{(province of}\\ \text{the court)}}} \quad (1)$$

This hypothetical-deductive reasoning based on the odds form of the Bayes theorem allows for the evaluation of the strength of evidence using LRs, which leads to the quantitative degree of support for one hypothesis against the other. That is to say, the strength of the present evidence is expressed in the form of LR value of two alternative hypotheses. Its numerator is used to estimate the probability of getting the evidence assuming H_0 hypothesis is true; its denominator is used to estimate the probability of getting the same evidence assuming H_1 hypothesis is true. The relative evidence strength in support of the hypothesis is reflected in the magnitude of LR value. The relative deviation of LR value from the unity (=1) provides an indication on the strength of the evidences. The more the LR deviates from unity, the greater the support for either prosecution hypothesis (i.e. when LR > 1) or defence hypothesis (i.e. when LR < 1). The closer the LR value approaches the unity, the less useful the evidence becomes, because it means that the evidence provides almost equal degree of support for both hypotheses [17].

The more similar between the questioned recording and suspect's recording(s), the more likely they come from the same speaker and therefore the higher the ratio will be. However, this must be

balanced by the typicality of samples or features in the relevant population. The more typical the two samples or features in the relevant population, the more likely they have been taken randomly from the population, and the lower the ratio will be. The numerator of LR quantifies the degree of similarity between the questioned recording and suspect's recording(s), and the denominator quantifies the degree of typicality of the questioned recording in the reference (relevant) background population. Hence, LR value is the result of interaction between both factors of similarity and typicality. LR framework makes it clear that both factors are necessary to evaluate the strength of evidence.

CALCULATION OF LIKELIHOOD RATIOS

A. Multivariate kernel-density approach

LRs can be calculated using the multivariate kernel density (MVKD) formula developed by Aitken and Lucy [18] and implemented by Morrison [19]. This formula evaluates the difference between the suspect's and the questioned samples with respect to their typicality in the reference distribution estimated using data from samples taken from the appropriate relevant population. Within-speaker variance is estimated using a normal distribution model, and between-speaker variance is estimated using a kernel density model. Compared to most automatic speaker recognition systems which first calculate scores of difference between pairs of speech samples and then use these scores as inputs to a discriminative or generative model, the generative Aitken and Lucy formula calculates LRs via direct estimation of the probability densities of the original feature variables.

B. GMM approach

In forensic speaker recognition, when a forensic speaker verification system is used to compare the questioned recording and the suspect's recording, a statistical model of one of them (normally the suspect's recording, because its duration is usually longer than questioned recording) using the various features extracted from corresponding speech has to be established. The likelihood values are estimated from the comparison of features of questioned recording and the suspect's model. The statistical model of the suspect can be represented by GMM, which has been successfully applied to cepstral feature vectors in many fully automatic speaker recognition systems [20]. For a D-dimensional feature vector, the mixture density used for the likelihood function is defined as:

$$p(x \mid \lambda) = \sum_{i=1}^{M} \omega_i p_i(x) \qquad (2)$$

$$p_i(x) = \frac{1}{(2\pi)^{D/2} \mid \Sigma_i \mid^{1/2}} \exp\{-\frac{1}{2}(x-\mu_i)^T \mid \Sigma_i \mid^{-1} (x-\mu_i)\} \qquad (3)$$

The mixture density is a weighted linear combination of M unimodal Gaussian densities, $p_i(x)$, each parameterized by a mean $Dx1$ vector m_i and a DxD covariance matrix, S_i.w_i are the mixture weights, and satisfy $S^{m}_{i-1} w_i = 1$. The parameters of GMM are denoted as, $l=\{w_i, m_i, S_i\}$, where i=1,....,M.

The forensic-speaker-recognition evidence does not consist in speech per se, but in the degree of similarity between speaker dependent features extracted from the questioned voice and same features extracted from the suspect voice, represented by his/her GMM model [21]. When the questioned voice is limited only the suspect's voice can be used to evaluate the within-speaker variability. GMM can be used to model both within-speaker variability of the suspect and between-speaker variability. The likelihoods are explicitly represented by probability density models. Mathematically, H_0 is represented by a model denoted $l=_{hyp}$, which characterizes the hypothesis H_0 in the feature space. For a Gaussian distribution, $l=_{hyp}$ denotes the mean vector and the covariance matrix parameters. The alternative hypothesis, H_1, is similarly represented by the model denoted $l=_{hyp}$. The values of LR are then expressed by Eq. (4). In this study we propose a new solution for modeling the

automatic parameters (Mel frequency cepstral coefficients, MFCC) of vowel tokens using GMM. The middle stable segment (32ms) of vowel /a/ was selected to compute MFCC. The MFCCs were then pooled together to train the multi-dimension GMM, whose dimension number is the same with the order of MFCC.

$$p(X \mid \lambda_{hyp}) / p(X \mid \lambda_{\overline{hyp}}). \qquad (4)$$

Fig.1 is a demonstration of LR calculation process. The dotted curve represents the within-speaker distribution trained using the suspect's data, which satisfies H_0 hypothesis. The solid curve represents the between-speaker distribution trained using reference data, which satisfies H_1 hypothesis. The feature used here is the first formant of vowel /a/ of males. Suppose that the measured mean F1 of the criminal's voice is 800Hz, it will be evaluated in two distributions mentioned above. For the within-speaker distribution, the likelihood value is p1=0.0103; for the between-speaker distribution, the likelihood value is p2=0.0048; therefore, the LR value of this example is p1/p2=2.1321, that is to say, according to the present analysis, this evidence (only F1 of vowel /a/) is 2.1321 times more supporting H_0 hypothesis than supporting H_1 hypothesis. The result supports that the questioned recording and the suspect's recording are spoken by the same person, but its strength is very low. This magnitude of LR value wouldn't provide strong and valuable evidence for court.

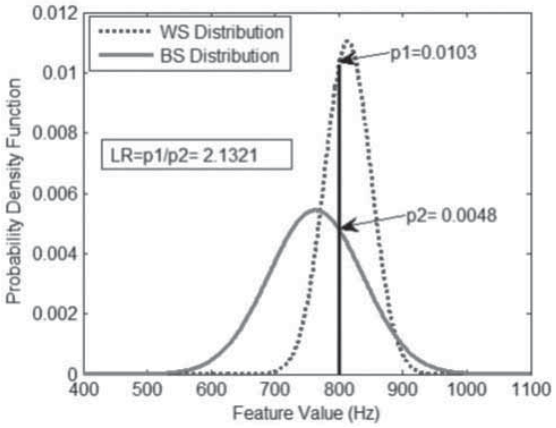

Fig. 1 Demonstration of LR calculation using GMM

C. Accuracy of measurement

A log-likelihood-ratio-cost function is used to assess the accuracy of the semi-automatic forensic speaker verification system in this study. It is independent of prior probabilities and costs, and has been adopted by the National Institute of Standards and Technology Speaker Recognitions (NIST SRE) . It is calculated using Eq. (3).

$$C_{llr} = \frac{1}{2}\left(\frac{1}{N_{ss}}\sum_{i=1}^{N_{ss}}\log_2\left(1+\frac{1}{LR_{ss_i}}\right)+\frac{1}{N_{ds}}\sum_{i=1}^{N_{ds}}\log_2\left(1+LR_{ds_j}\right)\right) \qquad (5)$$

In Eq. (5), N_{ss} and N_{ds} are the numbers of same-speaker and different-speaker comparisons; LR_{ss} and LR_{ds} are the LR values calculated from the same-speaker and different-speaker comparisons. As a metric of reliability of a speaker verification system, C_{llr} has previously been used in both fo-

rensic automatic speaker recognition systems and the acoustic-phonetic forensic voice comparison research [22]. More reliable systems produce smaller C_{llr} values and less reliable systems produce larger C_{llr} values.

EXPERIMENTS

The database includes 42 male speakers' recordings of Standard Chinese, aged between 19 and 23. Each speaker was recorded on three different sessions, the first session was about one week earlier than the second session, and the first session was about one month earlier than the third session. Speech was elicited by a research assistant, who phoned the speakers and asked them a series of questions such as: "What's your name?", "What's your mobile telephone number?" Recordings were made via the university internal telephone system using a KCM HCD9999/TSDL telephone, which has an in-build analogue cassette tape recording facility. Recordings were digitized and saved as 16 bit PCM sound files at a sampling frequency of 11.025 kHz. The number "8 /pa/" was chosen for analysis because it is considered as a lucky number by a lot of Chinese and more tokens can be found in the telephone numbers. Also speakers tend to stress it when they give these numbers. In addition, according to Gea de Jong [23] from University of Cambridge, the pronunciations of /i:, a:, c:/ have all indeed remained quite stable when compared to other monophthongs.

A cross-validated procedure was adopted in the experiment as follows:

1) Four tokens of /a/ were selected randomly from all tokens (for each speaker there are 22~106 tokens) of each speaker in the database, each time only one token was used as questioned data to make comparisons, so there will be four LR results in a same- speaker comparison.
2) Every questioned token was used to compare with his own remaining tokens (the four tokens selected above were excluded) in all three non-contemporaneous recordings.
3) The questioned token was used to compare with each other speakers' all tokens in all three non-contemporaneous recordings to get different-speaker LRs.
4) All the speakers' data except those being compared were included into the reference population database during LR calculation.

The 42 speakers produced 42 same-speaker pairs and 42(42-1)/2=861 different-speaker pairs. LRs were calculated using Aitken and Lucy's MVKD formula and GMM approach respectively. The 14th-order Mel frequency cepstral coefficients (MFCC) were used as multiple dimensions features and 256 sampling points hamming windows were added to the stable part of vowel /a/ with the pre-emphasis coefficient 0.97. In the training of GMM, one mixture was used for the suspect features to represent within-speaker variation and two mixtures were used in the training of reference population model to represent between-speaker variation (We assume that there is very limited tokens for questioned data). More mixtures will cause the GMM not to converge within 200 iterations. Expectation-Maximization (EM) algorithm and diagonal-matrix were used in the training of GMM.

RESULTS AND DISCUSSION

In the discussion below, LRs will be frequently expressed on a base-ten-logarithmic scale. This is convenient because on a logarithmic scale large positive numbers provide greater support for same-speaker hypothesis and large negative numbers provide greater support for different-speaker hypothesis. For example, a $\log_{10}$ LR of +1 indicates that the evidence is 10 times more likely to be observed under same-speaker hypothesis than under different-speaker hypothesis, and a $\log_{10}$ LR of -1 indicates that the evidence is 10 times more likely to be observed under different-speaker hypothesis than under same-speaker hypothesis.

Cross-validated results and C_{llr} values of different comparison are given in Table 1. In table 1 "T1, T2, T3 and T4" represent the first, second, third and fourth questioned token of each speaker respectively, which were used to calculate the cross-validated LRs. "Mean" represents the mean value of LRs when each token in T1, T2, T3 and T4' was used. "Fusion" represents the linear fusion of LR values resulted from each of the four tokens. The fusion results were calculated using the Focal

toolkit [24] and Logistic Regression calibration was also applied in the fusion procedure. "ER_SS" and "ER_DS" represent the error ratios of same-speaker comparisons (False Rejection Probability) and different-speaker comparisons (False Acceptance Probability) respectively. From C_{llr} values in this table we can conclude that the third (T3) token of each speaker is the biggest and the fourth (T4) is the smallest whatever MVKD or GMM was used. The C_{llr} value of "Mean" is smaller than any of them, but it is not as good as the fusion result.

Table 1 Error Ratio and C_{llr}

	ER_SS (MVKD)	**ER_DS (MVKD)**	C_{llr} **(MVKD)**	**ER_SS (GMM)**	**ER_DS (GMM)**	C_{llr} **(GMM)**
T1	0.2381	0.1823	0.7311	0.3333	0.1243	0.7891
T2	0.1429	0.1974	0.6885	0.3095	0.1336	0.8799
T3	0.1429	0.1731	0.8342	0.2619	0.1382	1.3873
T4	0.1667	0.1870	0.5504	0.2619	0.1301	0.6322
Mean	0.0476	0.2613	0.4867	0.1429	0.2033	0.5105
Fusion	0.1190	0.1603	0.4556	0.1667	0.1580	0.4295

Fig. 2 and Fig. 3 show the Tippett plots of the mean and the fused cross-validated LRs using MVKD and GMM respectively. The curves rising to the left represent the proportion of different-speaker comparisons with $\log_{10}$ LRs equal to or greater than the value indicated on the x-axis. The curves rising to the right represent the proportion of same-speaker comparisons with $\log_{10}$ LRs equal to or less than the value indicated on the x-axis. The vertical line is the threshold which is zero in base-ten-logarithmic scale. The solid curves represent the fusion result of the LRs and the dashed curves represent the mean result of the LRs.

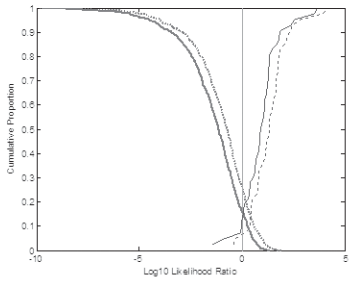

Fig. 2 Tippett plot of the mean (dashed lines) and fused (solid lines) cross-validated LRs using MVK approach.

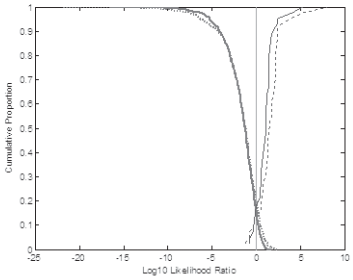

Fig. 3 Tippett plot of the mean (dashed lines) and fused (solid lines) cross-validated LRs using GMM approach.

From Fig. 2 and Table I, we can see that the mean error ratio of different-speaker is high, that is the false-positive ratio is high, which is not expected in forensic evidence evaluation. If we applied the four tokens data of every speaker together in the MVKD approach, the results not listed here would be worse than the mean of LRs. Therefore, pooling the four tokens into MVKD together is not a good way to calculate LR values. After fusion, the error ratio of different-speaker decreased from 0.2613 to 0.1603 and C_{llr} value decreased from 0.4867 to 0.4556. The fused results using GMM are more reliable than using MVKD when C_{llr} values were taken into account because the data deviated from the mean of the features are refined during the modeling of GMM which are not the case for MVKD approach.

Compared with the results of [25], in which the error ratio of same-speaker comparisons is 0.0476 and the error ratio of different-speaker comparisons is 0.0667 calculated using the first three formants of /a/, the error ratios of this study are much higher. That is because only one token was used in this study to assess the evidence strength of one vowel. The purpose of doing this is to test whether the forensic speaker verification methods can still work under the extreme condition with very limited questioned data. Of course, if more tokens or more vowels are measured and their results are fused, the much better discriminant performance can be achieved. Moreover, all recordings on three different sessions were used to make analysis in this study and only recordings on one session were used in [25]. Comparisons using non-contemporaneous recordings can potentially result in poorer results than using contemporaneous recordings.

CONCLUSION

This study was aimed to test the discriminant performance of forensic speaker verification systems based on statistical models when very limited questioned data are provided. The results show that the MVKd and GMM methods with vowel cepstral coefficients both give reasonable discriminant performance under this particular condition with very limited questioned data, but GMM model outperforms MVKD model in this case.

REFERENCES

1. D.Meuwly and A.Drygajlo, "Forensic Speaker Recognition Based on a Bayesian Framework and Gaussian Mixture Modeling (GMM)", In Proc. of Odyssey'2001 ISCA Speaker Recognition Workshop, Crete (Greece), 2001:145-150.
2. C.G.G. Aitken, F. Taroni, Statistics and the Evaluation of Forensic Evidence for Forensic Scientist, 2nd, Wiley, Chichester, UK, 2004.
3. Association of Forensic Science Providers, Standards for the formulation of evaluative forensic science expert opinion, Sci. Justice 49 , 2009: 161–164.
4. D.J. Balding, Weight-of-evidence for Forensic DNA Profiles, Wiley, Chichester, UK, 2005.
5. J. Buckleton, A framework for interpreting evidence, in J. Buckleton, C.M. Triggs, S.J. Walsh (Eds.), Forensic DNA Evidence Interpretation, CRC, Boca Raton, FL, 2005: 27–63.
6. I.W. Evett, Towards a uniform framework for reporting opinions in forensic science case-work, Sci. Justice 38 , 1998: 198–202.
7. D. Lucy, Introduction to Statistics for Forensic Scientists, Wiley, Chichester, UK, 2005.
8. Geoffrey Stewart Morrison, Forensic voice comparison and the paradigm shift, Science and Justice 49, 2009: 298–308.
9. Drygajlo A. Forensic automatic speaker recognition. IEEE Signal processing Magazine, 2007, 24(2):132-135.

10. D. A. Reynolds, T. F. Quatieri, and R. Dunn, "Speaker verification using adapted Gaussian mixture models," Digital Signal Processing, vol. 10, no. 1-3, 2000: 19–41.
11. Gonzalez-Rodriguez J., Drygajlo A., Ramos-Castro D., Garcia-Gomar M., Ortega-Garcia J. Robust estimation, interpretation and assessment of likelihood ratios in forensic speaker recognition Computer Speech and Language, 20 (2-3 SPEC. ISS.), 2006: 331-335.
12. Geoffrey Stewart Morrison, Cuiling Zhang, Philip Rose, An empirical estimate of the precision of likelihood ratios from a forensic-voice-comparison system, Forensic Science International, Volume 208, Issues 1-3, 20 May 2011: 59-65.
13. Becker, Timo, Jessen, Michael, Grigoras, Catalin (2008): Forensic speaker verification using formant features and Gaussian mixture models, IINTERSPEECH-2008: 1505-1508.
14. Morrison G.S. A comparison of procedures for the calculation of forensic likelihood ratios from acoustic-phonetic data: Multivariate kernel density (MVKD) versus Gaussian mixture model-universal background model (GMM-UBM) Speech Communication, 53 (2), 2011: 242-256.
15. Daniel Ramos-Castro, Extended Abstract for Best Ph.D. Thesis Award:Forensic Evaluation of the Evidence Using Automatic Speaker Recognition Systems, VI Jornadas en Tecnología del Habla and II Iberian SLTech Workshop, FALA 2010.
16. A. Drygajlo, D. Meuwly, and A. Alexander, Statistical Methods and Bayesian Interpretation of Evidence in Forensic Automatic Speaker Recognition,. in Proc. Eurospeech 2003, Geneva, Switzerland, 2003: 689-692.
17. P. Rose, Technical forensic speaker recognition: Evaluation, types and testing of evidence, Computer Speech and Language, vol.20, 2006: 159-191.
18. Aitken, C. G. G. and Lucy, D. Evaluation of Trace Evidence in the Form of Multivariate Data, App. Stat., Vol. 54, 2004: 109–122.
19. Morrison, G. S., Matlab Implementation of Aitken & Lucy's (2004) Forensic Likelihood-Ratio Software Using Multivariate-Kernel-Density Estimation [software], 2007. Available: http://geoff-morrison.net.
20. Douglas A. Reynolds, Richard C. Rose, Robust Text Independent Speaker Identification using Gaussian Mixture Models, IEEE Trans. Speech and Audio Process., vol. 3, no. 1, Jan. 1995: 72-83.
21. P. Rose, Forensic Speaker Identification. Taylor & Francis, 2002.
22. N. Brümmer, J. du Preez, Application independent evaluation of speaker detection, Comp. Speech Lang., vol. 20, 2006: 230–275.
23. De Jong, Gea; McDougall, Kirsty; Hudson, Toby; Nolan, Francis, The speaker discriminating power of sounds undergoing historical change: A formant-based study, the Proceedings of ICPhS Saarbrücken, 2007: 1813–1816.
24. N. Brümmer, FoCal Toolkit, July 2005. http://niko.brummer.googlepages.com/focal/
25. Wang Huapeng, Yang, Jun, The comparison of "Idiot's Bayes" and multivariate kernel-density in forensic speaker identification using Chinese vowel /a/, 2010 3rd International Congress on Image and Signal Processing, v 8, 2010: 3533-3537.

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RESERACH ON THE REVERSE ANALYSIS METHOD OF MALWARES - THE EXAMPLE OF "LURKER"

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Abstract: Analysis of malwares is essential for computer security professionals and digital forensic analysts and is emerging as an important field of research. Reversing technique is the most important technique and tool of knowing what software has done. This paper applies this technique to malware analysis. This paper introduces the basic concepts, methods, and functions of the reverse analysis process. The focus of this paper is to show the general patterns ascertained using reverse analysis applied to the aspects of start function, parameter transfer of function, data structure, control statement and Windows API. A case study of malware, used to obtain account information, login names, and passwords for online games, is presented to illustrate how the reverse analysis process quickly and accurately locates key information used to determine general patterns.

Keywords: Malware; reversing; start function; parameter transfer; data structure; control statement; Windows API

INTRODUCTION

After the Trojan Horse of information collecting is planted into the object system and is run, it can record and collect all kinds of important information in the object system, such as account names, account passwords, the system operations, key information of keyboard. Then it can send these collected information to the suspect by the way of sending E-mails regularly or actively visiting specified webpages in order to help him get the illegal profits. The Trojan Horse of information collecting becomes the criminal tools of the law breakers while destructing the Internet security. It not only leads to large amount of economic lost of Internet users, but also brings bad influence to the social public security.

So the research of digital data forensics on Trojan Horse malware, especially Trojan Horse malware of information collecting, is always the hot and difficult problems[1]. The ability to forensically analyse malware is becoming an increasingly important discipline in the field of digital forensics. This is because malware is becoming stealthier, targeted, profit driven, managed by criminal organizations, harder to detect and much harder to analyse. Malware analysis requires a considerable skill set to delve deep into malware internals when it is designed specifically to detect and hinder such attempts.

Reverse technique is a method used to attempt to recover the design details of software which have no source codes and accurate references. Reverse analysis of malware involves the disassembly of executable malware files to fully understand the behavior of the malware. The disassembly of the malware creates a mnemonic representation of the binary code which is used to discover the function of the program. This code is used to ascertain the capabilities of the malware, the data structure of various interfaces, and the logical process of the malware. This process obtains crucial evidence and clues which, using other methods, an investigator would not be able to acquire. Section 2 is an important part of this paper. Section 2 recapitulates the features of disassembled malware code programmed in different languages from the five aspects of start function, parameter transfer of function, data structure, control statement, and windows API. Section 2 also summarizes the analysis method used to quickly and accurately locate key information. Section 3 uses the real case study to show the applications of the methods introduced in section 2. These methods were applied to the malware program "Lurker". Section 4 summarizes the main work of this paper, points out the shortcomings, and makes prediction about the future developing trends of analyzing malware.

REVERSE ANALYSIS METHODS ON MALWARES

START FUNCTION

When compiling software, it is quite often to realize WinMain function in source code which is Main Function. But Windows programs do not start from WinMain function when it is running, but executes the codes relating to start function. This piece of codes is generated automatically by the compiler. After the start function is executed, the WinMain function is called. By using reverse analysis, we can determine the practical written language of malwares by start function. In practice, the digital investigator usually utilizes tools to determine the specific written language, such as PEiD[2]. However, sometimes the tool will be deceived by the trap designed by the suspect. For example, PEiD determines that one software is written in "Microsoft Visual C++ 6.0 [Overlay]", but the software is not written in Visual C++. Sometimes a program is very likely that a file, which is determined to be "Not a valid PE file", is truly an executable file disguised by instructions. So it is quite necessary to determine the actual written language of malwares through start function. This section focuses on the characteristics of start function of programming languages, such as Visual C++, Borland C++, Delphi, VB, assembly language.

Use OllyDBG to load malware specimen. If the program is written in Visual C++, such words as "push -1" (or "push FFFFFFFF"), "call dword ptr [<&kernel32.GetVersion>]"(acquire the information of Windows version), "call dword ptr [<&kernel32.GetCommandLineA>]" (pointer pointing at procedure command line), "call dword ptr [<&kernel32.GetStartupInfoA>]" (acquire the start information of the procedure) often appear in the disassembly instruction column in the assembly window. Besides, after run this program in OllyDBG, if the words of "MFC" appear in the module window (as shown in Fig. 1), it is shown that this program is written in Visual C++.

```
10000000 0003A000 1001BF5D safemon
5ADC0000 00037000 5ADC1626 uxtheme  (system)
5D170000 0009A000 5D1734BA COMCTL32 (system)
61BE0000 0000D000          MFC42LOC (system)
62C20000 00009000 62C22EAD LPK      (system)
71A10000 00008000 71A11638 WS2HELP  (system)
71A20000 00017000 71A21273 WS2_32   (system)
73640000 0002E000 73659FE1 msctfime (system)
73D30000 000FE000 73D373C8 MFC42    (system)
```

Fig. 1: "MFC" Appearing in the Module Window of Visual C++

If the malware program is written in Delphi language, its disassembly instruction is regular. It is usual that call statement and mov statement appear at intervals (as shown in Fig. 2). Two adjacent JMP statements will appear in the start function of the Borland C. The disassembly statement of VB is not regular. There are large amount of JMP statements in the beginning part. The statements written in assembly language are usually regular. Usually, it is composed of several statements of push, call, mov and so on[3].

```
E8 00D6FAFF  call   00405C60
A1 58A14500  mov    eax, dword ptr [45A158]
8B00         mov    eax, dword ptr [eax]
E8 E0E1FFFF  call   0045684C
A1 58A14500  mov    eax, dword ptr [45A158]
8B00         mov    eax, dword ptr [eax]
BA B0864500  mov    edx, 004586B0
E8 DFDDFFFF  call   0045645C
8B0D 48A2450 mov    ecx, dword ptr [45A248]
A1 58A14500  mov    eax, dword ptr [45A158]
8B00         mov    eax, dword ptr [eax]
8B15 EC7D450 mov    edx, dword ptr [457DEC]
E8 CFE1FFFF  call   00456864
A1 58A14500  mov    eax, dword ptr [45A158]
8B00         mov    eax, dword ptr [eax]
```

Fig. 2: Instructions of Program Written in Delphi Being Regular

In general, malwares are efficient and the size of the program is small. The above five languages are the most frequently chosen languages by malware. Understanding disassembly code characteristics of start function of different languages can judge quickly and accurately the real written language of malwares. Thus we can find out the breakthrough.

PAPAMETERS TRANSFERRING OF FUNCTION

The parameters transferred by the function which is included in malwares are usually the important information of the user's name, user's password, e-mail address and webpage address. This section focuses on quickly locating the statements of transferring function parameters in disassembly instructions in order to acquire the specific information of parameters[4].

Generally, the parameter transferring is achieved in the two ways of stack or combination of register and stack. The way of stack is more widely used. The so-called stack is a storage area of "first in last out". The pointer of top of the stack, that is ESP, points to the first usable data item of the stack. In the calling function, the caller pushes the parameters onto the top of the stack (making use of push instruction) one by one. After the function is called, acquire the parameters from the stack. After the function is run, restore to the original stack, that it balancing stack. The objects of the stack operation are generally word operation (four bytes). The order of pushing onto the stack should obey the calling convention. Different languages have different calling conventions. Most languages transfer the parameter from the right to the left. For the unoptimizable compiler, use a special register (EBP) for parameter addressing. The function's executing procedures of most high-level languages are almost the same. The specific procedure is as the following:

a. The caller pushes the returned addresses and parameters of the function into the stack;
b. The subroutine makes use of "EBP+offset" for parameter addressing of the stack, then take out the parameters;
c. The subroutine uses the instruction of ret or retf for returning.

Take the following stdcall convention for example to explain the changing process of the stack when calling the function of Trojan (Par1, Par2). First, push Par2 and Par1 into the stack. Next, call the subroutine and store the original EBP pointer to protect the scene. Then, set a new EBP pointer, pointing to ESP (that is top of the stack). Then, call Par1 and Par2 through offset address from EBP[5]. At the same time, allocate storage space for the local variables through changing the pointer of top of the stack. The specific codes and notes are as the following.

```
Push  par2                push par2 into the stack
  Push  par1                push par1 into the stack
  Call  Trojan              call the subroutine
    (
Push  ebp               store the original EBP pointer to protect the scene
    Mov   ebp ,esp          set a new EBP pointer pointing to ESP
    Mov   eax, dword prt[ebp+0c]  call par2
Mov   ebx, dword prt[ebp+08]   call par1
Sub   esp, 8            esp-8, storage space for local variable
……
Add   esp, 8            release the stack occupied by local variable
Pop   ebp               protected EBP pointer pops, then restore the scene
Ret   8                 return to parent routine
)
```

The changing process of the stack in the process of calling function is as shown in Fig. 3. Through analysis, it is found out that generally *[ebp+08]* stores the first parameter, *[ebp+0C]* stores the second parameter, etc. The local variables within the function use *[ebp-04]*, *[ebp-08]*, and other facets to read and write. If the compiler compiles the program according to optimization mode, in order to save the EBP register or decrease codes as much as possible to increase the speed, the compiler will directly use *esp* for parameter addressing. Now, *[esp+04]* and *[esp+08]* store par1 and par2

respectively. As to the returned value of the function, under the situation of using *return* operator to achieve returning, generally use *eax* and *edx* register to store the returned value or use the pointer to achieve returning[6].

.....	Starting Stack
Parameter 1	EBP+Ch
Parameter 2	EBP+8
Returning Address	EBP+4h
Stored EBP	EBP+0h
Variable 1	EBP-4h
Variable 2	EBP-8h
.....	Current ESP Pointer

Fig. 3. The Changing Process of the Stack When Calling Function Trojan

DATA STRUCTURE

The data structure is the main mode for the computer system to store, organize and manage data. Understand disassembly code of typical data structure will play an important role in analyzing malware behavior. As the access mode of local variable has been discussed in Section 2.2, this section emphatically discusses the access of typical data structure, such as global variables, arrays, linked list.

The global variable acts in the whole program and stored in some area of the memory, generally is stored in the data block (.data). So generally use specific memory address to achieve access.

```
int C;                          int main(void)
int main(void)                      { static int lwh[3]={1,2,3};
 {                              int i,sum=0;
      int A=5,B=6;                   for(i=0;i<3;i++)
      C=7;                          sum=sum+lwh[i];
  ......                         ......
}     }
```

Example program of global variable *Example program of array*

In the statements of the global example program, A and B are local variables, C is a global variable. After using OllyDBG disassembly for processing, the instruction statements shown in Fig. 4 are acquired. Through analysis it is known that for local variable A and B, compiler uses *[ebp-04]* and *[ebp-08]* to assign values. But for global variable C, compiler uses fixed memory address *[4084C0]* to assign value. Other statements using C variable also use this address for access. So if specific memory address appears several times in disassembly code, it is very likely that this address stores global variable, which needs special attention[7].

```
55            push    ebp
8BEC          mov     ebp, esp
83EC 08       sub     esp, 8
C745 FC 0500( mov     dword ptr [ebp-4], 5
C745 F8 0600( mov     dword ptr [ebp-8], 6
C705 C084400( mov     dword ptr [4084C0], 7
```

Fig. 4. Disassembly Code of Example Statement of Global Variable

Next, we discuss the access mode of array structure. In the array example program, lwh[3] is the array that has been defined in the main routine. After processed by using OllyDBG disassembly, the instruction statements shown in Fig. 5 are acquired. Through analysis, it is known that compiler first set *eax* to be 0 through "xor eax,eax" statement. Next, use the two statements of "mov edi,dword ptr

[eax+407030]" and "add eax,4" to repeatedly achieve the goal of visiting all elements in the array of lwh in turn. Among them, "cmp eax,0C" is the loop control statement in order to guarantee only visiting the three elements in lwh array. So if there is the statement of register address plus memory address for access in disassembly code, and at the same time combined with compare and jump statement, it is very likely that they are array access statement.

```
83EC 0C      sub     esp, 0C
33C9         xor     ecx, ecx
33C0         xor     eax, eax
56           push    esi
57           push    edi
8BB8 3070400 mov     edi, dword ptr [eax+407030]
83C0 04      add     eax, 4
03CF         add     ecx, edi
83F8 0C      cmp     eax, 0C
```

Fig. 5. Disassembly Code of Array Example Statement

Linked list is a widely used method for the memory to manage the data. From the reverse angle, the biggest difference between linked list and array lies in that the data item of the linked list is stored dispersedly in the memory. Except including effective payload, every data item also includes the pointer pointing to next data item. (The doubly-linked list even includes the pointer pointing to the previous data item.) So in the disassembly code of malware using linked lists, generally the statements of acquiring payload information and acquiring pointer information will appear in adjacency. For example, the statements of "mov eax,dword ptr[esi+68]" mov ecx,dword ptr[esi+64]" send the information of payload and pointer to eax and ecx registers respectively[8].

CONTROL STATEMENT

Analyzing control statements to identify key jumping or key calling is a very important aspect of malware behavior analysis. Generally, the high-level language uses such statements as IF-THEN-ELSE or SWITCH-CASE and other statements to judge the process. It has the features of clear organization, good maintainability and other features. This section emphatically discusses identifying and analyzing methods of control statements.

The disassembly statement of IF-THEN-ELSE statement generally uses such commands as cmp, fcmp, fcomp for comparing. Then use the commands of jz or jnz to realize jumping. Under some situations, compiler may use comparatively short logic instructions like "test" or "or" to substitute "cmp" instruction, such as executing the statement of "test eax , eax" (If eax is 0, ZF is set to be 1 or ZF is set to be 0.). Then jump according to the specific value of ZF.

But for SWITCH-CASE statement, after compiled, it is a nested combination of several IF-THEN statements. Under the situation that the compiler is not optimized, there are several jump instruction combination of cmp and je commands, and other commands (as shown in Fig. 6). Under the situation that the compiler is optimized, generally the cmp command needing much cost is not used. Instead, after using the mathematical operation command for processing, conduct jump. What deserves special mention is that when the compiler is optimized, use mathematical techniques into transform the logic branch statement of the source code to mathematical operations in order to remove or reduce the condition jump instructions of the program, then to improve CPU performance[9]. Now the control statement has no apparent features to identify (Sometimes it even has no jump statement.). Under such situation, the accurate judge should be made through complete analysis according to the context.

```
837D F8 01   cmp     dword ptr [ebp-8], 1
74 0E        je      short 00401031
837D F8 02   cmp     dword ptr [ebp-8], 2
74 17        je      short 00401040
837D F8 0A   cmp     dword ptr [ebp-8], 0A
74 20        je      short 0040104F
EB 2D        jmp     short 0040105E
```

Fig. 6. Disassembly Code Features of SWITCH-CASE Statement

WINDOWS API

One of the common methods in analyzing malwares is to set breakpoint in the debugger. When the malware runs to the breakpoint, the debugger gives the control right to the digital investigator to continue analysis. So it is very important for quick and accurate analyzing malwares to set accurate and appropriate breakpoint. Good breakpoint setting can help us find the key program segment quickly. However, inappropriate breakpoint will result in unnecessary energy consuming in the analysis work. Some even can not play a role in intercepting program running. As the program of executing malicious function often calls special API function or self-programmed function to complete corresponding function. Under rare situation, it is probable that the corresponding prompt information appears. This section starts from API function to discuss the breakpoint setting in the malware.

Windows API (Application Programming Interface) is the function set defined by Windows system. It provides the methods of access to the features of operating system. API includes hundreds of functions waiting to be called by application. These functions execute those operations relating to operating system, such as memory allocation, screen output, creating windows, and so on. The user program makes contact with the operating system through calling API interface. No matter what kind of application, its bottom realizes all kinds of functionalities through calling various API functions in the end. It is necessary for the malware to complete its functions (such as generating files, modifying registry, information transferring) through API functions. For example, in the aspect of file reading and writing, the breakpoint can be set in OpenFile, ReadFile, WriteFile, CreateFileA, SetFilePointer, CopyFileA, GetSystemDirectory. In the aspect of registry, the breakpoint can be set in RegOpenKeyA(W), RegOpenKeyExA(W), RegCreateKeyA(W), RegCreateKeyExA(W). In the aspect of network information transferring, the breakpoint can be set in FtpGetFile, FtpPutFile, InternetOpen, InternetConnect, InternetOpenUrl, URLDownloadToFile[10].

It should be pointed out that the functions of Windows can distinguish character set: A represents ANSI, W represents Wide (that is Unicode). The former generally is single byte mode. The latter is double byte mode. The functions relating to characters in Windows all provides the versions of these two modes. Suppose using GetWindowText function when programming, but actually compiler will call GetWindowTextA or GetWindowTextW automatically according to the configuration. So if set breakpoint in GetWindowTextA and the program is not interrupted, then consider setting breakpoint in GetWindowTextW.

Here still introduces techniques of checking functions called by the program by making use of OllyDBG. Run malwares in OllyDBG, if there is prompt information or dialog in this program, you may click F12 or pause button on the toolbar. Then execute ALT+K or click K button on the toolbar to open the window of calling the stack, inside which appears the API function information of corresponding dialog window. In the actual case analysis of the Section 3, we will introduce the specific use of this method. Besides, some malwares disguised as normal softwares will have prompt information when running. Sometimes, setting breakpoint in this prompt information often plays a role in interrupting the running of the program and finding out key program segment.

CASE STUDY

INVESTIGATION SCENARIO

Online game is an sustainable online game for many persons with the processing terminals of game servers of operators and user computers, with the information interactive windows of game client software and with the goal of entertainment, leisure and communication. Nowadays, the virtual property, such as game equipment, involved in the online game account, can be transformed into actual currency. So the phenomenon of stealing online game accounts and passwords is rampant day by day. A serious act even breaks the law. "Lurker" is a malware for stealing accounts and passwords of online games. This malware steals the accounts information of popular online games, such as Menghuanxiyou, The Semi Gods and Semi Devils, Jianwang, QQ Warrior of Subterranean City, through infecting the windows system files of Dsound.dll, Ddraw.dll. This section takes online game Trojan Horse of Lurker for example to illustrates the practical application of reverse process in digital data evidence collecting.

ANALYSIS ON ONLINE GAME TROJAN HORSE "LURKER

CHECK THE SHELL AND UNPACK

First check the Trojan Horse shell of Lurker through PEiD, as shown in Figure 7. The result of shell checking shows "Nothing found (Overlay)". PEiD does not find out in which language this Trojan Horse is written. But it finds out the additional data of this Trojan Horse. Chech its EP section to know the value of its .rdata,.data,.rsrc is 0. Then use OllyDBG to load this software. The prompt shows this software is a self-extracting or self-modifying file. The start function does not show the typical features of all kinds of programming language, either. So it is conclude that this software is compacted or encrypted[11].

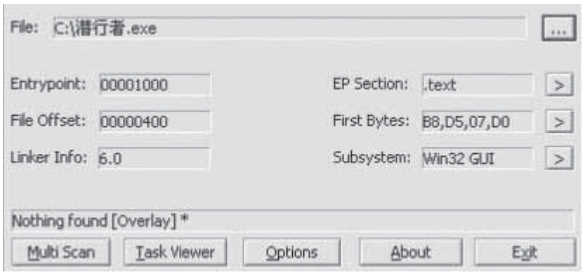

Figure 7 Checking Shell Result of Lurker by PEiD

Use OllyDBG to load this software. Press F8 to execute step by step. After the instruction of "pushad" in 0040D06F is executed, the ESP value of registry window is 0012FFA4 (as shown in Figure 8). Now use ESP law to choose data window following and set breakpoint of hardware visiting in data window. Next press Shift+9 to run this software. Then meet another big jump, that is address of 0040D06D.

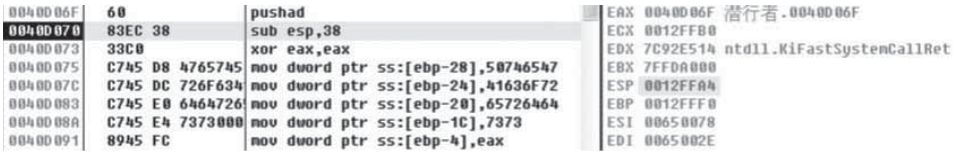

Figure 8 Unpack by Using ESP Law in the Address of 0040D070

Execute the instruction of "jmp eax" in the address of 0040D06D to come to the actual OEP00404794 of the program. There is the word of "push -1" in the list of disassembly instruc-

tions of the start function. This meet the features of start function of Visual C++. After unpacking repairing, PEiD judges that it is written in Microsoft Visual C++. Thus it is proved that the result of checking shell is correct.

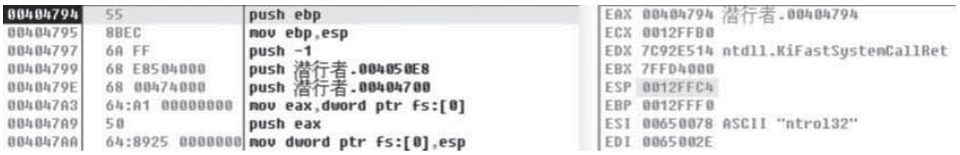

Figure 9 Start Function Instruction List of Lurker after Unpacking

MAIN MALICIOUS BEHAVIOR OF LURKER

After unpacking Lurker, use OllyDBG to load. There are the statements shown in Figure 10 in its disassembly codes. As described in section 2.2, this Trojan Horse dismantles the string of SeDebugPrivilege into the ASCII codes of "53", "65", "44", "65", "62", "75", "67", "50", "72", "69", "76", "69", "6C", "65", "67", "65" and store them in [ebp-1C] as local variables for subsequent calls in order to avoid the checking and killing of the whole strings.

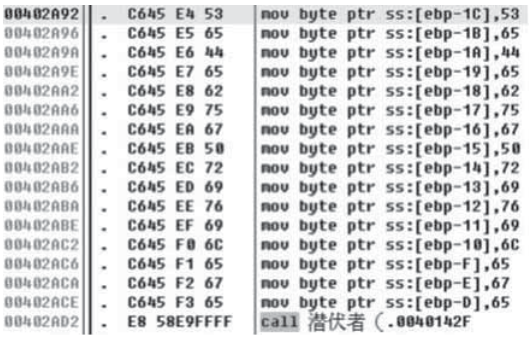

Figure 10 Lurker Avoiding being Searched and Killed by Split Strings

Besides, as malware usually executes memory operations, it often uses malloc function to apply for memory space of designated bytes. According section 2.5, suppose setting breakpoint in malloc function. Execute instruction of "bp malloc" in the command window of OllyDBG. Then press Shift+F9 to run program. The analysis will be continued after break. According to Figure 11, the program is broken in 0040371B. By analyzing codes, it is found out this malware prefers using malloc function to allocate some memory[12]. It uses memset function to clear the memory and then execute "call 00402B14" to finish some operation. At last, it calls free function to release the allocated memory. So "CALL 00402B14" is the key point in main program, which needs deep and meticulous analysis.

Figure 11 Malware will Break automatically in the Set Breakpoint.

Press F7 to go into the function pointed by the address of 00402B14 and continue to run the program step by step. When running to the address of 00402BDE, the program writes information to the address of 00406070. Check the memory in the address of 00406070, then find out the installing information of "SOFTWARE\Microsoft\Windows\CurrentVersion\Uninstall_is1" (Figure 12). According to this method, the installing information of online games, such as Semi Gods and Semi Devils, Jianwang, QQ Warrior of Subterranean City. In this way, this malware detects the registry of the infected system to make sure if the relevant online games are installed.

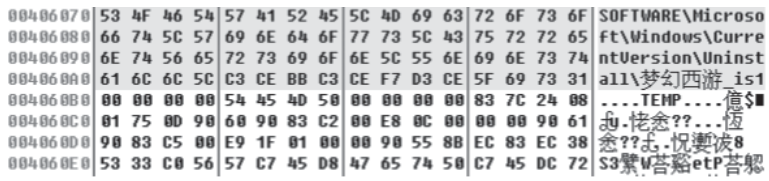

Figure 12 Installing Information of Online Game of Menghuanxiyou in Memory

Besides, the loop statements of assigning values to arrays appears in the disassembly code of Lurker (Figure 13). According to section 2.4, it is concluded that this loop statement is to fill the 3rd to the 6th of the char array with random content (the arrange is from 0 to 9). So the released file has no fixed name. Thus it can avoid checking and killing of anti-virus software.

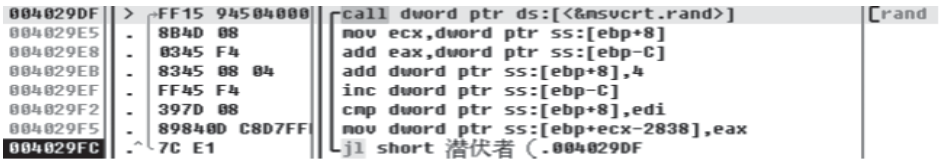

Figure 13 Loop Statement of Assigning Values to Arrays

When the program runs to 00404316, there are the words of "C:\WINDOWS\system32\ dsound.dll.dat" in stack space (Figure 14). Through comprehensive analysis, it is found out that Lurker substitutes c:\windows\system32\ dsound.dll for dsound.dll.dat generated by itself. Thus the goal of hijacking the system is reached. Similarly, this program can also substitute Ddraw.dll for ddraw.dll.dat generated by itself[13].

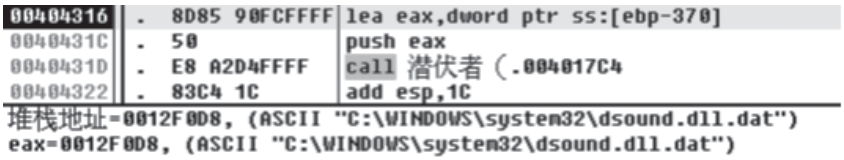

Figure 14 Lurker generates dsound.dll.dat.

REVERSE ANALYSIS ON dsound.dll.dat

Use PEiD to check the differences between dsound.dll.dat and dsound.dll. The left of Figure 15 displays the details of PE file head of dsound.dll.dat. The right displays the details of PE file head of dsound.dll. According to Figure 15, the node number of dsound.dll is 4. the node number of dsound.dll.dat is 5. The oep of dsound.dll is 00001788 (in .text section). The oep of dsound.dll.dat is 0005C000 (in the additive .text8 section). The size of image file of dsound.dll is 5C000. But the size of image file of dsound.dll.dat is 5D000.

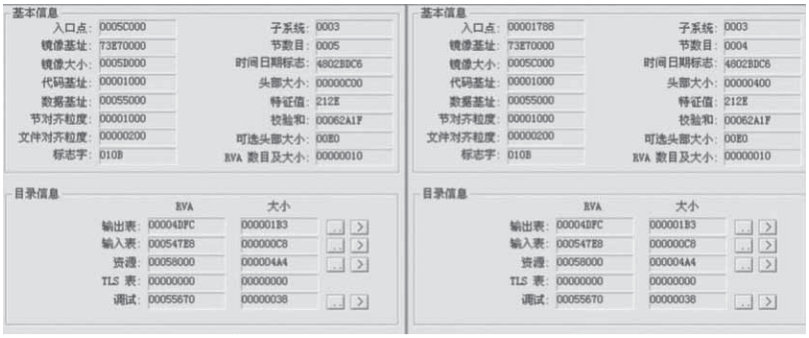

Figure 15 Comparison of PE File Head between dsound.dll.dat and dsound.dll

Use OD to load dsound.dll.dat. It is found out that there are several continuous combinations of test commands and jnz jump instructions in its disassembly code. According to section 2.4, this program actually uses condition control statements to test if there are processes of avp.exe, RavMonD.exe, 360Safe.exe in the system. Once they are found, the relevant processes are ended.

```
68 D0304000     push dsound_d.004030D0          ASCII "avp.exe"
E8 C1F8FFFF     call dsound_d.00401220
83C4 04         add esp,4
85C0            test eax,eax
0F85 B1010000   jnz dsound_d.00401B1B
68 C4304000     push dsound_d.004030C4          ASCII "RavMonD.exe"
E8 ACF8FFFF     call dsound_d.00401220
83C4 04         add esp,4
85C0            test eax,eax
0F85 9C010000   jnz dsound_d.00401B1B
```

Figure 16 There are Loop Control Statements in Disassembly Instruction List.

When debugging dsound.dll.dat, we find out that this malware outputs strings or decrypted information to some specified address space of the memory. So set writing breakpoint in this memory address space and do not ignore memory access abnormity in the debugging option setting. After tracking and debugging, there is decrypted information in 10004C48 as shown in Figure 17. According to Figure 17, after this malware steals user names and passwords of online games, it will send the information to ASP web address which has be planted already.

```
10004C48: 68 74 74 70 3A 2F 2F 68 61 68 61 35 2E 68 61 6F  http://ha[illegible].ha
10004C58: 2F 72 65 6E 36 37 38 2E 63 6F 6D 3A 38 30 31 31  /re[illegible].com:8011
10004C68: 2F 66 65 6E 2F 71 6C 6E 62 32 30 2F 4D 4F 70 70  /Fe[illegible]20/MO[illegible]
10004C78: 2E 61 73 70 00 00 00 00 00 00 00 00 00 00 00 00  .asp............
10004C88: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
```

Figure 17 Decrypted ASP Web Address Appears in Memory

CONCLUSIONS AND FUTURE WORK

The programmers of malware generally have comparatively high-level professional knowledge. They will blur the activities of malware by all means to conceal its real intention. This requires much more of the digital investigator [14]. They should perform an in-depth analysis of the code. This paper is based on the basic principle of reverse analysis. It summarizes the general law of disassembly code of malwares from the aspects of start function, function parameter transfer, data structure, control statement, windows API, and other aspects. In addition, it uses a real case which occurred in China to explain the specific methods of quickly and accurately locating key information. It should be pointed out that some aspects of the research work in this paper are still in the stage of exploration and attempt. Take the programming language of malware for example; this paper discusses

common languages such as Visual C++, Borland C++, Delphi, VB, and assembly language except .NET. The part of typical data structure discusses array and linked list, and does not analyze tree structure which is more complicated. Besides, it is a future trend in the research of the author on how to better combine the reverse analysis method with other methods in order to more completely expose concealed secrets of the malware.

REFERENCES

1. Eldad Eilam. Reversing: Secrets of Reverse Engineering. Indiarapolis, Indiana, US: Wiley, ISBN 0764574817; 2005.
2. Gang Duan. Encryption and Decryption. Beijing, CHN: Publishing House of Electronics Industry, ISBN 9787121066443; 2008.
3. Kanxue BBS, <http://bbs.pediy.com>.
4. Black Eagle BBS,<http://www.4800hk.com/forum-13-1.html>.
5. TWCERT. Spware Forensic with Reversing and Static Analysis. <http://www.hitcon.org/Download/2006/
6. Spyware%20Forensic%20With%20Reversing%20and%20Static%20Analysis.p-df>, 2006.
7. Wenhua Luo. The Research on Method of Digital Investigation for Information Collecting Trojan. Journal of Forensic Technology 2011;4:S56-58.
8. Craig Valli, Murray Brand. The Malware Analysis Body of Knowledge (MABOK). <http://citeseerx.- ist.psu.edu/viewdoc/download?doi=10.1.1.149.4690&rep=rep1&type=pdf>, 2008.
9. Wenhua Luo. The Application of Reverse Analysis on Digital Investigation. Journal of Computer Applications 2011;31(11):S2975-2978.
10. Wenhua Luo. Research on Analysis Method of Malware Based on Reverse Technology. Chinese Journal of Forensic Sciences 2011;59(6):S58-62.
11. Wenhua Luo. The Technology of Unpack Shell on Digital Investigation. Journal of Police Technology 2011; 1: S34-36.
12. Patryk Szewczyk. Malware Detection and Removal: An examination of personal anti-virus software.<http://scissec.scis.ecu.edu.au/proceedings/2008/forensics/Szewczyk%20%20Brand%20Malware%20detection.pdf>, 2008.
13. Martin Overton. Malware Forensics: Detecting the Unknown.< http://momusings.co.uk/Documents/VB2008
14. Malware-Forensics-1.01.pdf>,2008.
15. James M. Aquilina, Eoghan Casey & Cameron H. Malin. Malware Forensics Investigating and Analyzing Malicious Code. Burlington, MA, US: Syngress, ISBN 159749268X; 2008.
16. Carvey H. Windows forensic analysis. Norwell, MA, US: Syngress, ISBN 159749156X;2007.

UDC: 343.983:662.215.1(510)

A THEORY SYSTEM OF DELAYED DETONATING EXPLOSIVE DEVICES IN CHINA

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Abstract: Meeting the urgent need for an efficient investigation and analysis technique of explosion scene, based on summing up the type and structure of explosive devices from explosion cases in China, this paper presents a study of the delayed detonating explosive devices. Starting with the basic principle of delayed detonating explosive devices, a system study is made on the type, detonating principle and important components of delayed detonating explosive devices to construct a theory system of delayed detonating explosive devices, which provides a more direct technical support for the disposal and analysis of explosion scene. This paper's primary coverage is as follows.

On the basis of summing up the type and structure of explosive devices from explosion cases in recent years, starting with the basic structure and principle of explosive devices, this paper classifies the explosive devices into several types according to different detonation ways of explosive devices.

This paper constructs a theoretical system of delayed detonating explosive devices based on the basic theory of explosive devices. It includes the basic structure, types and detonation principle of delayed detonating explosive devices; the characteristics and performance parameters of the key component parts of detonating explosive device; the demonstration of feasibility and reliability of typical delayed detonating explosive devices, and so on.

According to the delayed detonation energy source, delayed detonating explosive devices can be divided into simple fire ignition delayed detonating explosive devices, electric delayed detonating explosive devices, chemical delayed detonating explosive devices, etc. According to the classification criteria, this paper makes a systematic discussion on the structure characteristics, performance parameters and the working principle of the key component parts of all types of delayed detonating explosive devices through the decomposition experiment, which provides the technical support for the recovery analysis of delayed detonating explosive devices.

Key Words: Explosive Devices Delayed Detonation Key Components

INTRODUCTION

The explosion case is a serious violent crime, which can be very destructive, can endanger public safety, people's lives and property safety, and can cause serious casualties and losses. So it has a direct, wide range impact on social stability and economic development. Explosive devices are the core of explosion cases. The technique of explosive devices in China continues to become more complicated with the development of science and technology, from simple fire ignition detonating explosive devices to simple electric detonating explosive devices, and then a series of complicated explosive devices in explosion cases, such as delayed detonating explosive devices, anti-active detonating explosive devices, trigger detonating explosive devices and so on. According to the statistics in recent years in China, delayed detonating explosive devices have been more applied than other electric detonating explosive devices in 1017 explosion cases since 2005. There are many kinds of key components of delayed detonating explosive devices, such as quartz clocks, mechanical clocks, and fan timers, which are often used at the explosion scene. In general, there have been more electronic delayed detonating explosive devices in explosion cases in addition to traditional fire ignition delayed detonating explosive devices and mechanical delayed detonating explosive devices. Because of this situation, new requirements and challenges for analysis and disposal of delayed detonating explosive devices appear on the scene.

THE CONCEPT AND COMPOSITION OF EXPLOSIVE DEVICES

An explosive device consists of dynamite and a detonating system. Explosive devices can be divided into two categories, one is the standard explosive devices, known as the "bomb", such as military bombs, mines, grenades, artillery shells, dynamite packages, civilian blasting tube and perforation bombs, mainly used for military and civilian blasting, and the other non-standard, refers to "improvised explosive device" (IED), which are mostly self-made. Criminals and murders often use explosive devices to kill people and/or cause destruction. Such devices are mostly IED. The paper describes this kinds of explosive devices as key points.

An explosive device is usually composed of package, dynamite, and detonating system. Package (Container) is often used to wrap up the explosive device. This can play a part in making explosive devices portable, disguising explosive devices, making explosive devices waterproof, making loose explosive devices or dynamite in the assembled state, can make explosive devices be detonated more easily, and all of the dynamite in explosive devices detonated, and all of the energy of dynamite can increase the destructive effects and produce fragments. Dynamite is the energy of destruction, the damaging effects and killing effects depend on the type, quality and quantity of dynamite in the explosive device. Detonating systems are composed of a variety of equipment or components, and provide energies for the primary dynamite. Detonating system is generally composed of controlling system, detonating components and energies.

TYPES OF EXPLOSIVE DEVICES

According to different detonating way of common explosive devices in explosion cases, the paper divides explosive devices into several types, such as delayed detonating explosive devices, remote detonating explosive devices and anti-passive detonating explosive devices, anti-demolition detonating explosive devices, trigger detonating explosive devices, mobile phone controlling detonating explosive devices, infrared controlling detonating explosive devices, multi-dimensional combination detonating explosive devices and so on.

THEORETICAL STUDY OF THE DELAYED DETONATING EXPLOSIVE DEVICES

Delayed detonating explosive devices (included the timed detonating explosive devices) need a certain amount of time to explode automatically. In order to make explosion for specific targets, and have enough time to run away from the scene without being hurt or captured, criminals usually design delayed detonating explosive devices to bomb. Delayed detonating explosive devices have a high frequency of occurrence in actual cases, and can be divided into several categories, such as fire ignition delayed detonating explosive devices, electric delayed detonating explosive devices, and chemical delayed detonating explosive devices.

A delayed detonating explosive device is generally composed of package, dynamite and delayed detonating system. It is essentially connected with delay components on the basis of conventional explosive devices; delay components can make explosive devices explode after some time. Delayed detonating explosive devices are shown in Figure 1.

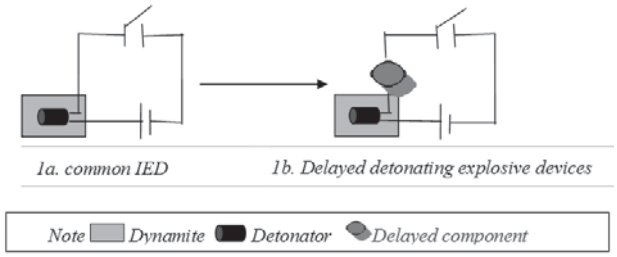


Figure1. Delayed detonating explosive devices

In recent years, the delay components of delayed detonating explosive devices in explosion cases usually are easier to obtain in daily life, and easily modified. Due to the difference between delay components used in explosive devices, the principle and destruction effect is also different. For example, clock delayed detonating explosive devices can delay accurate explosion time within 12 hours; this kind of delayed detonating explosive device is called timed detonating explosive devices. The delayed time of traditional fuse delayed detonating explosive devices can only be roughly estimated based on the length of the fuse.

Delayed detonating explosive devices are divided into several types according to detonating energies, including fire ignition delayed detonating explosive devices, electric delayed detonating explosive devices, chemical delayed detonating explosive devices, and so on.

FIRE IGNITION DELAYED DETONATING EXPLOSIVE DEVICES

Fire ignition delayed detonating explosive devices are generally composed of package, dynamite and fire ignition delay detonating system; fire ignition delay detonating systems are generally composed of fire controlling systems, thermal detonators, fuse, wires and other parts. Fire ignition delayed detonating explosive devices in explosion cases are mainly divided into several types, such as fuse delayed detonating explosive devices, cigarette delayed detonating explosive devices, incense delayed detonating explosive devices, candle delayed detonating explosive devices, and so on.

ELECTRIC DELAYED DETONATING EXPLOSIVE DEVICES

Electric delayed detonating explosive devices are generally composed of package, dynamite, and electric delay detonating systems. Electric delay detonating systems are generally composed of electric controlling system, electric detonator, wires and other parts. According to the summary of explosion cases in China, in recent years, electric delayed detonating explosive devices mainly include mechanical delay detonating explosive devices, electronic delay detonating explosive devices and failure circuit delayed detonating explosive devices.

(i) MECHANICAL DELAYED DETONATING EXPLOSIVE DEVICES

Mechanical delayed detonating explosive devices mainly include mechanical clock delayed detonating explosive devices, quartz clock delayed detonating explosive devices, electronic watch delayed detonating explosive devices, mechanical timer delayed detonating explosive devices, Walkman delayed detonating explosive devices and so on .

The detonating system of mechanical clock delayed detonating explosive devices is composed of mechanical clock, batteries, electric detonator and other parts, which can use the traveling time

or alarm function of mechanical clock, in other words, use the face of mechanical clock or alarm system to control the detonating time. Traditional mechanical clocks are often used by criminals in delayed explosive devices in a variety of methods.

A metal plate is fixed on the dial of a quartz clock, and the other metal plate is fixed on the hour or the minute pointer. The hour or the minute pointer makes contact with the metal plate on the dial plate at the preset time. If metal plates are fixed to the hour pointers, the timing range can be up to 12 hours; if the metal plates are fixed to the minute pointers, the timing range can be within one hour. When the pointer fixed to the metal plate contacs the dial fixed metal plate, the circuit is turned on, and the explosive devices explodes.

Mechanical timers are important components of mechanical timer delayed detonating explosive devices; a small piece of iron or a nail is fixed to the knob of the timer, which is the contact point of the circuit; and another piece of iron or nail is fixed in the position of the "O" of the dial, which is the other contact point of the circuit; each of the contact point has a wire. They constitute a circuit, which is respectively connected to the batteries and electric detonators. When the pointer to which the iron or the nail is fixed goes back to "O" position on the dial, the circuit is turned on, the electric detonator explodes detonating the dynamite.

Walkman delayed detonating explosive devices are composed of a Walkman (including the tape), batteries, electric detonator, dynamite and so on. Dynamite is charged in the Walkman or bundled on the Walkman, at the same time, the switch of the ignition circuit is connected to the timing switch of the Walkman or contact points of tape. When the switch is turned on or the tape moves to the contact point, the circuit is turned on; electric detonator is detonated, causing the dynamite to explode. Pre-pressed record button, turns on the switch, tape begins to move, the Record button pops up at the end of the tape rotation, two metal plates fixed to the Walkman contact, the circuit is turned on, electric detonator explodes, which detonates the dynamite .

(ii) ELECTRONIC DELAYED DETONATING EXPLOSIVE DEVICES

Electronic delayed detonating explosive devices include electronic watch delayed detonating explosive devices, electronic clock delayed detonating explosive devices, mobile phone delayed detonating explosive devices, BP machine delayed detonating explosive devices, electronic timer delayed detonating explosive devices, and so on.

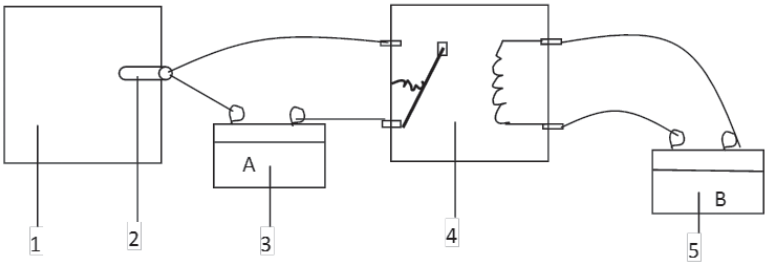
Criminals take advantage of the principles of electronics to make electronic watch delayed detonating explosive devices, which can be accurately controlled. Technically, the modification way of electronic watch delayed detonating explosive devices are more complex than those of mechanical watch. Criminals need a certain expertise, but the applicability of electronic watch delayed detonating explosive devices is relatively flexible, and the time can be very short or long, and the detonating systems of the explosive devices are more reliable. Electronic watch delayed detonating explosive devices are composed of an electronic watch, peripheral amplification circuit, electric detonators, dynamite, batteries, and so on.

Electronic clock delayed detonating explosive devices are composed of a quartz clock, batteries, dynamite, electric detonator, and so on. One point of the wires is fixed to the positive of the batteries, and the other point is fixed to the quartz clock buzzer. When the quartz clock reaches the set time, the buzzer alarms and crystal oscillates, the circuit is turned on, and the electric detonator is detonated, detonating the dynamite.

Mobile phone delayed detonating explosive devices are composed of a mobile phone, the external amplification circuit, electric detonators, dynamite, batteries, and other parts. The external amplification circuit is connected to the timer in the mobile phone, and they are connected to the dynamite, batteries and electric detonators, when the presetting time is reached, the explosive device explodes.

Electronic timer delayed detonating explosive devices are composed of an electronic timer, the peripheral amplification circuit, batteries, electric detonator, dynamite, and so on. The electronic timer is common equipment in daily life, and it can be set time arbitrarily, which breaks with the conventional methods of setting time within 24 hours, as the detonation time can be set into years or even decades.

The delayed of failure circuit is the detonating systems of failure circuit delayed detonating explosive devices. After the start of the detonating system, the relay controlled by failure circuit makes circuit turn off, battery energies of the circuit are gradually consumed with the time passed, when the current is insufficient to maintain the minimum current of the relay work, the relay would be from non-closed state to closed, which turns on the detonating circuit, and then the electric detonator explodes, detonating the dynamite. Its working principle isshown in Figure 2.



1 – Dynamite 2 – Detonator 3 - Battery A 4 - Relay 5 - Battery B
Figure2. Failure circuit delayed detonating explosive devices

(iii) OTHER ELECTRIC DELAYED DETONATING EXPLOSIVE DEVICES

The delayed system of drip delayed detonating explosive devices consists of two plastic cups, a floating electrode and a stationary electrode. Two cups are stacked, the upper cup is filled with water, there is a little hole at its bottom; there was a stationary electrode on the ridge of the lower cup, a floating electrode at the bottom of the lower cup, both of them have wires, and are connected with batteries and electric detonator. When the water droplets falling from the upper cup to the lower cup reach a certain number, the floating electrode of the lower cup began to move up, and finally it gets in contact with the stationary electrode, the circuit is switched on, and the electric detonator detonates the dynamite.

The detonating system of metal powder delayed detonating explosive devices consists of a funnel, container, metal powder, batteries and so on. The funnel filled with the metal powder is fixed on the top of the container, two electrodes are respectively fixed on the upper and lower side of the container, and both of them are connected to detonating circuit, when the funnel leaks the metal powder, after a certain period of time, the metal powder buries the two electrodes, the detonating circuit is turned on, electric detonator explodes and detonates the dynamite.

CHEMICAL DELAYED DETONATING EXPLOSIVE DEVICES

The detonating system of chemical delayed detonating explosive devices rely on the chemical reactivity of certain substances to achieve controlling functions. There are two types, one type is that two separated sheets are fixed between chemical liquid and dynamite, and the chemical liquid contacts with dynamite after separated sheets are corroded and detonate the dynamite; the other type is the controlling insurance of explosive device is corroded by the chemical liquid, and thus the system is detonated.

EXPERIMENTAL STUDIES OF KEY COMPONENTS OF DELAYED DETONATING EXPLOSIVE DEVICES

Delayed detonating explosive devices are composed of package, dynamite, detonator, delay detonating system and other parts. Delay detonating system is the core component of delayed detonating explosive devices; it can consist of a lot of components. The paper discusses the structural characteristics, functions and working principles of key and typical components of delayed detonating systems.

THE DECOMPOSITION OF KEY COMPONENTS OF DELAYED DETONATING EXPLOSIVE DEVICES

The decomposition of key components of delayed detonating explosive devices are quite useful for grasping the morphological features, which is the basis of distinguishing the types of the fragments of explosive devices at explosion scene.

After a careful decomposition, it is found that the quartz clock is mainly comprised of many gears, dial, pointers, the shell, screws, armature, copper coils and other components. Its original appearance and decomposition characteristics were shown in Figure 3 ~ Figure 4.

Figure3. Quartz clock

Figure4. Composition and morphology of quarts clocks

After a careful decomposition, it is found that the fan timer is mainly comprised of gears, the plastic shell, wires, coils, screws, spindle components and so on. Its original appearance and decomposition characteristics were shown in Figure 5 to Figure 6

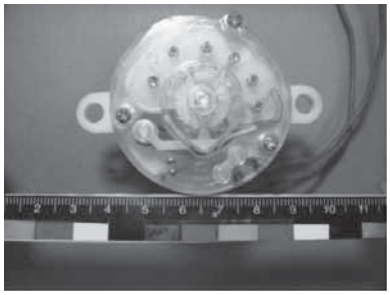


Figure 5 Fan's timer

Figure 6 Composition and morphology of fan's timer

After a detailed decomposition, it is found that the mechanical timer mainly consists of knobs, dials, the shell, gears, the coil, screws and so on. Its original appearance and decomposition characteristics were shown in Figure7 to Figure8.

Figure7 Mechanical timer

Figure 8 Composition and morphology of mechanical timer

Electronic delay detonating systems mainly refer to the electronic clock, mobile phones and other key components of the explosive device, the experiment study of the electronic clock as a key point, the electronic clock is mainly comprised of electronic displays, circuit boards, screws, buttons, batteries and other components. Its original appearance and decomposition characteristics were shown in Figure 9 to Figure 10.

Figure 9 Electronic clock

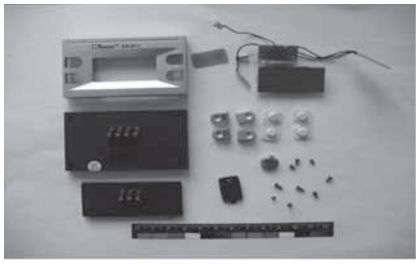


Figure10 Composition and morphology of electronic clock

The key component of failure circuit delayed detonating explosive devices mainly refers to the relay. After a detailed decomposition, the relay is mainly comprised of plastic shells, magnets, metal rings, resistor, the shrapnel, screws and other parts. Its original appearance and decomposition characteristics were shown in Figure 11 to Figure 12.

Figure 11 the Relay

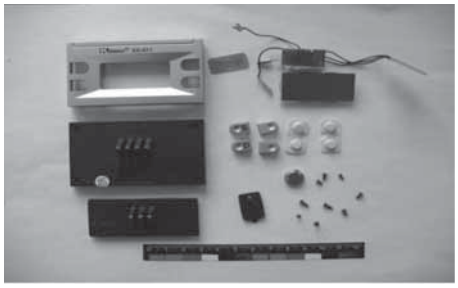


Figure12 Composition and morphology of the relay

ii. THE FUNCTIONS AND WORKING PRINCIPLES OF CRITICAL COMPONENTS OF DELAYED DETONATING EXPLOSIVE DEVICES

The paper discusses the functions and working principles of critical components of mechanical delayed detonating explosive devices, electronic delayed detonating explosive devices and failure circuit delayed detonating explosive devices as important points, based on the structural characteristics and decomposition studies of critical components of delayed detonating explosive devices.

The functions and working principles of critical components of mechanical delayed detonating explosive devices are distinct. The timing range of the mechanical clock or the mechanical watch is generally from 0 to 12 hours; the timing range of the washing machine timer is generally from 5 to 60 minutes; the fan timer is generally from 5 to 180 minutes; the kitchen timer is generally from 1 to 60 minutes.

The working principles of critical components of mechanical delayed detonating explosive devices are basically identical; their energy source is winder, speed governor is used for controlling the accuracy of the time, gear transmission manipulates movements according to the scheduled time. There are some timers of low accuracy, such as fan timers, washing machine timers, kitchen timers, etc., although their timing accuracy is not high, their structure is simple, and they are easy to use. There are also the timers of high accuracy, such as mechanical watches, which use the balance spring regulators. Mechanical delayed detonating explosive devices mainly use internal gears to achieve timing functions.

The critical components and timing range of electronic delayed detonating explosive devices are intricate. The timing range of electronic clocks is generally from 0 to 24 hours, However popular calendars are free to set time, which breaks the limits of conventional time setting; the timing range of the mobile phone or the BP machine is generally from 0 to 24 hours; the timing range of electronic timers is usually from 0 to 60 minutes or 0 to 100 minutes or 0 to 100 hours.

The working principles of key components of electronic delayed detonating explosive devices, which count time according to the standard frequency of quartz oscillator or civil AC, and then output control signals in according to the code of presetting time are identical, so they are called time accumulators or digital clocks. The electronic timer works correctly and has high precision timing, but controlling procedures are complicated. The minimum timing is generally 1 minute and can accurately be controlled for the period of one year starting from the moment the timing system is connected with microprocessors. Electronic clocks and calendars used in our daily lives are made by using this principle. At the same time, the principles of electronic timers have been used in microwave ovens, rice cookers, washing machines and other household appliances. Electronic delayed detonating explosive devices take advantage of changing internal circuits to output current to achieve delayed requirements.

The key component of failure circuit delayed detonating explosive devices is the relay, its timing range is affected by the time of the power that supplies the circuit, when the power supplying stops, and the relay works. Battery consumption time determines the relay working time.

The relay is usually composed of iron core, coil, armatures, and contact spring. When both ends of the coil have a certain voltage, there exists a certain current flow through the coil, which generates electromagnetic effects; the armature will be attracted to the core, so as to drive the armature dynamic contact with stationary contacts. Electromagnetic suction disappears when the coil is de-energized, the armature will return to its original position. Failure circuit delayed detonating explosive devices are made by the working principles of the relay.

CONCLUSION

Explosion crimes have the features of vile nature and great influence. Explosive devices are the core of explosion cases. The explosive devices gradually become diversified and complex with the rapid development of science and technology. Delayed detonating explosive devices are favored by criminals because of the characteristics of detonating conveniency, they are easy to hide, and so on.

The paper discusses the systematization of delayed detonating explosive devices in China based on the theories of explosive devices, and draws the following conclusions.

In accordance with traditional principles, explosive devices are divided into several types, such as delayed detonating explosive devices, remote detonating explosive devices, anti-active detonating explosive devices, anti-demolition detonating explosive devices, and trigger detonating explosive devices, light controlling detonating explosive devices, multi-combination detonating explosive devices and so on. The method of classification is more scientific, which includes explosive devices in explosion cases in recent years, which can provide theoretical guidance for the disposal of explosion cases.

Delayed detonating explosive devices are divided into several types based on the analysis of a large number of references, such as fire ignition delayed detonating explosive devices, electric delayed detonating explosive devices and chemical delayed detonating explosive devices and so on.

The paper studies key and typical components according to the classification standard of delayed detonating explosive devices, such as quartz clocks, mechanical clocks, washing machine timers, electronic clocks and so on. The paper sets a system of structural characteristics and working principles of key and typical components of delayed detonating explosive devices, which provides guidance to discover and discern the explosive fragments.

REFERENCE

1. Guoan Li. Countermeasures Tutorial of Explosion Crime. Press of Chinese People's Public Security University ,Beijing :1998

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343.982.4

DETERMINATION OF ABSOLUTE WRITING AGE OF IRON-BASED INK HANDWRITINGS

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Abstract: This research, which started from the general rule and fundamental equation of the substance diffusion, establishes a mathematical model of the diffusion of sulfate, and experimentally validates the effective time period obtained by a model. By using the proposed mathematical model, we can estimate the effective period of the handwriting written in Ostrich brand iron-based ink, as well as the diffusion coefficient of SO_4^{2-} of iron-based ink handwritings on different papers, thus estimating the absolute age of the iron-based ink handwritings.

Keywords: forensic science, document examination, iron-based ink handwriting, mathematical model, diffusion of sulfate, absolute writing age

INTRODUCTION

The iron-based ink is a common colorant for writing. It is necessary to add some sulfuric acid or sulfate to the ink in order to make the ink stable, waterproof, dry-faster and to simultaneously improve the deepness of the blue dye, so that it immerses easily into the paper fiber. While using this kind of ink to write the strokes contain the components of sulfuric acid or sulfate which are not visible to the human eye. As the age goes by, SO_4^{2-} will diffuse away from the ink-stroke into the surrounding paper, thus, the longer the time, the farther the diffusion distance. As a result, by measuring the diffusion distance of SO_4^{2-}, and comparing it with samples influenced by the same or similar conditions, we can estimate the relative writing age of the ink handwriting. There are many factors which could influence the diffusion of sulfate (such as environmental temperature, humidity, components of the ink, types of the paper, directions of the paper fiber, the shade of the handwriting stroke, etc)[1-2]. The relationship between the extent of the diffusion of sulfate and the age of the strokes is complicated. Up to date, the exact causation of the ink diffusion in the paper fiber remains unclear, although it is known that the diffusion of sulfate is a function of writing age, enabling it to become a suitable standard for determination of the age of handwritings. However, the generally suitable rule which could directly infer the absolute writing age from the numerical value of the stroke broadening has not been found. This research, which started from the general rule and fundamental equation of the substance diffusion, establishes the mathematical model of the sulfate diffusion and experimentally validates the effective period of the mathematical model. Therefore, it is now possible to determine the absolute age of the iron-based ink handwriting.

ESTABLISHMENT OF A MATHEMATICAL MODEL FOR SULFATE DIFFUSION

As soon as the ink handwriting is formed on the paper, the sulfate in the ink strokes starts to diffuse. This diffusion away from the ink stroke into the surrounding paper represents unsteady state diffusion (speeds of materials flow into and out of the diffusion layer are different from each other, materials will be accumulated in the diffusion layer, the concentration gradient will change following the time and distance) in a semi-infinite medium (the depth of the diffusion layer is much smaller than the medium distance in the direction of diffusion), which obeys Fake's second law of diffusion [3,4]. If the diffusion coefficient D is not very close to the concentration, D is constant at

fixed temperature and pressure, and considering the diffusion along the X axis only, Fake's second law of diffusion can be expressed by the partial differential equation as follows:

$$\frac{\partial c}{\partial t} = D\frac{\partial^2 c}{\partial x^2} \qquad (1)$$

In the equation, c represents the concentration (density in this system) in the diffusion direction; t represents diffusion time; D represents diffusion coefficient; x represents diffusion distance.

According to the specific situation of diffusion of SO_4^{2-} in paper, the boundary condition is:

$t=0,\ 0<x<\infty,\ c=0$ (primary density)

That is, the density of SO_4^{2-} in the blank place of the stroke is 0 before the beginning of diffusion.

$0<t<\infty,\ x=0,\ c=c^*$ (interface density)

That is, when the diffusion starts, the density of SO_4^{2-} at interface will become c* and this density remains constant in the diffusion process, because SO_4^{2-} in the stroke fills the interface continuously.

Firstly, the second-order partial differential equation in Fake's second law should be transferred to the first-order. According to the empirical rule of the function relation between (x, t) and c, that is, the width of the diffusion layer is proportional to the squared root of the time or to be the parabola to the time, we could presume that

$c=f\left(\frac{x}{\sqrt{t}}\right)$. If $y=\frac{x}{\sqrt{t}}$, $\frac{dc}{dy}=P$, we can obtain the values of $\left(\frac{\partial c}{\partial t}\right)_x$ and $\left(\frac{\partial^2 c}{\partial x^2}\right)_t$.

$$\left(\frac{\partial c}{\partial t}\right)_x = \left(\frac{\partial c}{\partial y}\right)_x\left(\frac{\partial y}{\partial t}\right)_x = \left(\frac{\partial c}{\partial y}\right)_y \cdot \frac{\partial}{\partial t}\left(\frac{x}{\sqrt{t}}\right) = -\frac{y}{2t}\left(\frac{\partial c}{\partial y}\right)_x = -\frac{yP}{2t}$$

$$\left(\frac{\partial^2 c}{\partial x^2}\right)_t = \left(\frac{\partial^2 c}{\partial y^2}\right)_t\left(\frac{\partial y^2}{\partial x^2}\right)_t = \left(\frac{\partial^2 c}{\partial y^2}\right)_t \cdot \left(\frac{\partial}{\partial x}\left(\frac{x}{\sqrt{t}}\right)\right)^2 = \frac{1}{t}\left(\frac{\partial^2 c}{\partial y^2}\right)_t = \frac{dP}{tdy}$$

Substituting the above two equations to equation (1), we get: $-\frac{yP}{2} = D\frac{dP}{dy}$

After the integral, we get: $-\frac{y^2}{4} = D\ln P + I$

Making the integral constant $I = -D\ln A$, the above equation can be simplified to $\ln\frac{P}{A} = -\frac{y^2}{4D}$.

Written as an exponential equation, $P = \frac{dc}{dy} = Ae^{-\frac{y^2}{4D}}$

Or $dc = Ae^{-\frac{y^2}{4D}}dy \qquad (2)$

Let $\zeta^2 = \frac{y^2}{4D}$ or $\zeta = \frac{y}{2\sqrt{D}} = \frac{x}{2\sqrt{Dt}}$, and $dy = 2\sqrt{D}d\zeta$, together the following boundary conditions:

$t=t,\ x=0,\ c=c^*,\ \zeta=0$

t=t, x=x, c=c, $\zeta = \frac{x}{2\sqrt{Dt}}$

The integral of equation（2） will be: $\int_{c^*}^{c} dc = \int_0^{\zeta} 2A\sqrt{D} \cdot e^{-\zeta^2} d\zeta$

or $c - c^* = 2A\sqrt{D}\int_0^{\zeta} e^{-\zeta^2} d\zeta$ （3）

Then, let us consider the boundary conditions below:

x=0, t=t, c=c*, ζ =0

x=x, t=0, c=0, $\zeta \to \infty$

Therefore, $-c^* = 2A\sqrt{D}\int_0^{\infty} e^{-\zeta^2} d\zeta = A\sqrt{\pi D}$, in which $\int_0^{\infty} e^{-\zeta^2} d\zeta = \frac{\sqrt{\pi}}{2}$.

So the integral constant will be $A = -\frac{c^*}{\sqrt{\pi D}}$

And the equation（3） becomes: $\frac{c^* - c}{c^*} = \frac{2}{\sqrt{\pi}}\int_0^{\zeta} e^{-\zeta^2} d\zeta$ （4）

This is a kind of transcendental function.Frequently it is called Gauss error function, that is,

$$erf\zeta = \frac{2}{\sqrt{\pi}}\int_0^{\zeta} e^{-\zeta^2} d\zeta$$

So the equation（4） also can also be written as

$$\frac{c^* - c}{c^*} = erf\zeta = erf\left(\frac{x}{2\sqrt{Dt}}\right) \quad \text{or} \quad \frac{c}{c^*} = 1 - erf\left(\frac{x}{2\sqrt{Dt}}\right) \qquad (5)$$

The equation (5) is a mathematical model of the density distribution at a place and time which we are acquiring, that will be the relationship formula of the diffusion density c of SO_4^{2-} at diffusion time t and diffusion distance x.

From the equation (5), we see that $\frac{c}{c^*}$ is a function of $\frac{x}{2\sqrt{Dt}}$. Although we assumed x and t to be different, we can assign the same value for $\frac{c}{c^*}$, if the ratio of $\frac{x}{\sqrt{t}}$ is the same Figure 1 indicates the relationship in equation(5).

From figure 1，we obtain that $\frac{x}{\sqrt{Dt}} = 4$ when $\frac{c}{c^*} \approx 0$. （6）

Equation (6) is the relationship between sulphate diffusion distance x and diffusion time t. We not only determined diffusion distance and time in a certain condition, but also measured the diffusion coefficient of SO_4^{2-} using the equation (6) .When the diffusion is at the primary stage, in which SO_4^{2-} in the stroke can fill into the interface unceasingly, always maintaining c*>>c, the equation is established. The diffusion coefficient D is relevant to environmental temperature, humidity, ink components, sulfate density in the stroke, type of the paper direction of the paper fiber and so on.

METHODS AND MATERIALS

5% $Pb(NO_3)_2$ solution, mixture of 4% $KMNO_4$, 0.5% HNO_3, 5% $Pb(NO_3)_2$ (mixture ratio is 2:1:2), 4% NH_3HCl solution, 20% Na_2SO_4 solution, and 4% Na_2S solution were used as experimental reagents. JC—10 reading microscope, illumination light, spot plate, cotton stick, and pencil were used as experimental equipments. Writing material, written on paper whose quota is 80g/m^2 using Ostrich brand iron-based ink at different times and writing material, written on paper whose quota 40g /m^2 using Ostrich brand iron-based ink at different times were used as experimental samples, while all the factors remained consistent.

Places where the thickness and shade are similar in ink strokes of different directions were marked as measuring points with pencil. The primitive width of the stroke at each measuring point was measured using the reading microscope. Experimental reagents were placed into wells of a spot plate, and ink stroke places needed to be measured coated with cotton sticks dipped into different reagents. At last, width of the stroke at each measuring point was measured using a JC—10 reading microscope. The differential value between this width and the primitive width represents the diffusion distance of the sulfate.

DATA PROCESSING AND ERROR COMPUTATION

We can obtain the diffusion coefficient D at different time points, when we consider the average value *X* of the measuring diffusion distance of each stroke in a mathematical model (2). Then, we can calculate the measuring error Dc and the function error D*D*. The writing age t of each examined material is a constant, so the function error D*D* which is caused by the measuring error Dc will be:

$$\Delta D = \frac{dD}{dx}\Delta x \quad \text{, that is} \quad \Delta D = \frac{x}{8t}\Delta x$$

in this equation Dc=|c-c| .

Theoretically, the diffusion coefficient D in a mathematical model should be a constant. But in fact, with aged writing samples, especially when the condition c*>>c cannot be satisfied, experimentally measured and calculated D will not be consistent. We can regard D as a constant if the absolute difference between the neighboring D is smaller than max(ΔD), when it is also a suitable assumption in this mathematical model.

RESULTS AND DISCUSSION

To experimentally verify the results on writing samples, different values were measured, calculated and shown in Table 1 and Table 2.

From Table 1 (80g/m^2 paper), we can see that the maximum value of function error max(ΔD) is 1.46×10^{-6} , and the age of written sample is 107 months when $|D_n-D_{n-1}|$ is smaller than the max(ΔD). Given the small degree of SO_4^{2-} diffusion in the short time since writing, it is expected to have larger experimental error. Considering practical experience, the time lapsed since writing at which obvious diffusion appears should be above 12 months. In conclusion, the suitable time range, under our mathematical model for specified condition, is 12 to 107 months, and the diffusion coefficient D (the average value during this time section) is 1.89 mm^2 per month.

From Table 2 (40g/m^2 paper), similarly as above, we can see that, the maximum value of function error max(ΔD) is 1.00×10^{-6} , and the age of written sample is 100 months when $|D_n-D_{n-1}|$ is smaller than the max(ΔD). Therefore, the suitable time range, under our mathematical model for specified condition is 12 to 100 months, and the diffusion coefficient D (the average value during this time section) is 2.35 mm2 per month.

As shown in Table 1 and Table 2, the diffusion coefficient D for the same kind of paper changes little in the primary diffusion period of SO_4^{2-}, and it is stable. In the later diffusion period, however, it has the trend to enlarge. The mathematical model (6) will not be correct in the later diffusion period of SO_4^{2-} until the condition $c^* >> c$ is met. But in the suitable time range, we can obtain x from the corresponding known samples, as well as D, measure x of the examined material and finally obtain the absolute writing age t using the equation (6).

Although there are a variety of the influencing factors, the sulfate diffusion coefficient D is dependant on the paper category. While maintaining the other factors constant, this research only considered the influence of the paper category. We found that the diffusion of SO_4^{2-} is smaller in high quota paper than in the low quota one. This is probably because the high quota paper is much more compact, with more complicated arrangement of the fiber, which decreases the paper fiber's capillary action.

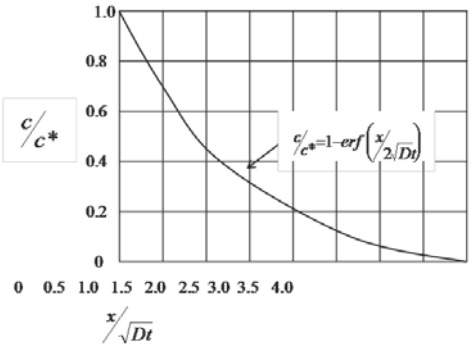

Figure 1.The relationship between density, time and distance in the course of the diffusion of SO42-

Table 1. Experimental results of the iron-based ink handwriting on the paper with 80 g/m2 quota

$\bar{x}$ (×10⁻³mm)	$\overline{\Delta x}$ (×10⁻³mm)	D (×10⁻⁶mm²/M)	ΔD (×10⁻⁶mm²/M)	$\lvert D_n - D_{n-1}\rvert$ (×10⁻⁶mm²/M)
96	15	4.48	1.46	2.16
63	11	2.32	0.81	0.20
57	10	2.12	0.74	0.19
56	9	2.31	0.74	0.27
53	11	2.58	1.07	1.27
36	9	1.31	0.65	0.11
33	9	1.42	0.77	0.11
28	11	1.53	1.20	0.03
23	7	1.50	0.91	0.10
16	4	1.60	0.80	0.33
9	4	1.27	1.13	

Table 2. Experimental results of the iron-based ink handwriting on the paper with 40 g/m2 quota

M)	$\bar{x}$ (×10-3mm)	$\overline{\Delta x}$ (×10-3mm)	D (×10-6mm2/M)	ΔD (×10-6mm2/M)	$\lvert D_n - D_{n-1} \rvert$ (×10^{-6}mm^2/M)
2	90	10	4.52	1.00	0.84
6	79	10	3.68	0.93	1.12
0	64	8	2.56	0.64	0.00
	62	11	2.56	0.91	0.00
	60	5	2.56	0.43	0.25
	55	8	2.31	0.67	0.24
	53	4	2.54	0.38	0.48
	39	7	2.07	0.74	0.06
	34	4	2.01	0.47	0.16
	27	5	2.17	0.80	0.12
	19	4	2.05	0.86	0.16
	11	4	1.89	1.38	

REFERENCES

1. Xie peng, Li biao, Mu xiaobin. Primary research about the mathematical model's construction of sulfate diffusion in ion-based ink handwriting. Criminal police & science technique.2003;(4):39-41.
2. Wang shiquan. Further research about the degree determination of sulfate diffusion in the ion-based ink handwriting. The anthology about file examination technology (3). Beijing: Chinese people public security university publishing house, 1992;172-5.
3. [USA] E.L.Coslar write, Wang yuxin translate. Medium transmit in the diffusion fluent system Beijing: chemical industry publishing house, 2002.
4. Hao wanglin edit. Material evidence analysis. Beijing: police officer education publishing house, 1993.

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629.33-592

PHOTOGRAPHIC METHOD OF ANTI-LOCK BRAKE TRACE EVIDENCE

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Abstract: Automobile tire treads during the braking of the surface is the main target of the traffic accident scene investigation, and also an important basis for the analysis of traffic processes. With an ABS braking system on motor vehicles in the domestic population, the application of anti-lock brake marks have also become important trace evidence at the accident scene. Followed by grass-roots, the police handling the case in the past used a single fixed method for routine physical evidence but they were unable to resolve a clear anti-lock brakes and stability to capture traces of the operation of the fixed problem. This paper discusses this widespread problem concerning the proposed anti-lock brakes accident scene. It captures traces of evidence approach, the use of certain photographic method on the road in different forms from the ABS brake friction when tire tread prints are fixed clear and complete for shooting. Text-ray examinations, respectively metering with photography, polarized light shade of photography and photographic materials and sub-surface light reflection review the basic model for the experimental basis for the theory of ABS braking system, brake marks generated by the experimental features of the starting point under the conditions of the existing conventional dry road, anti-lock brake marks on the fixed target experimental film, and the anti-lock brake marks on the object derived from textiles and road dust, tire bloodstain blot brake marks related to the tire special photographic film suggesting the regulation of the fixed operation.

Key word: ABS braking system, traces of anti-lock brakes, photographic evidence, polarized light photography, sub-shade photography

THE CHARACTERISTICS OF ABS EQUIPPED CAR BRAKE TRACES

The brake traces are impressed prints

The ABS system refers to the automobile anti-lock braking device. The brake traces of a car equipped with ABS system are impression due to the principle the ABS control. ABS essentially controls the degree of wheel slip in braking. When wheel slip ratio is 0, the left tire marks are rolling prints, when wheel slip was 100%, it leaves dragging prints. During emergency braking, ABS works maintaining the slip ratio of the wheel within a range of 15% -20%, so that the wheel is in the rolling and slipping state relative to the ground, and in that case the brake traces should be impressed marks. The ground braking traces morphology is lines like, and the deformation of the tire tread marks can be seen. These are typical characteristics of the impressed.

Brake traces of some vehicles are slight dragging traces

Theoretically; braking traces left by vehicles equipped with ABS generally will not leave the clear dragging prints. But the conclusions are not entirely consistent with some test results. Pausch (BOSCH) ABS tests carried out in France in 1980, showed that generally it will produce slight brake dragging prints. But the conclusion of Pausch ABS test in Germany (BOSCH) is as follows: only half of the test produces dragging prints and overall shape of the prints related to the applied force to the breaking pedal. If the applied force to the pedal increases to just the work of ABS, the dragging prints color are sometimes light and sometimes heavy, like a broken line. In another test: on rough road, sometimes heavy brake dragging prints caused by external characteristics. It is the ABS failure due to uneven road when vehicles instantaneously brake and produce dragging prints. When

applied, the excessive force to the pedal would cause the ABS instantaneous failure, so that the tire instantaneous locking, thereby produced two short black dragging prints and the general length is 1 meter.

Light brake traces, and cannot be found easily

Due to the strong sliding friction between the tire and the ground during the braking, the ordinary vehicle will leave the heave clear braking traces, so that the rubber particles on the surface of the tire will drop and adhere to the road. Equipped with ABS the vehicle will leave light brake traces, mainly because the ABS maintains the slip ratio of the wheel during the braking process of the vehicle within the range of 15% -20%. Resulting in the tire and the ground static friction is the main break force, and the sliding friction is secondary, which makes the amount of tire wear small. The tire side rolling and sliding will not cause the local wear. If a vehicle is equipped with the ABS, its brake marks mainly external characteristics are plane, less layer traces, therefore, the vehicle braking traces are light.

Brake traces easily disappear

If a vehicle is equipped with ABS, its brake trace is likely to disappear, mainly because the particles such as dust in the air will adhere to the surface traces and cover them because of gravity and external forces. That kind of brake trace itself is relatively faint, plus covered under the dust and other particles it will become blurred. Field experiments showed that: 20 minutes after the formation of traces, the traces of the starting point have been blurred. If there is much dust in the air or in the windy weather, the road tire marks may soon disappear.

No rubber particles left at the end of the brake traces

During the emergency braking process, the wheels sliding friction to the ground of the vehicles equipped with ABS is small, so the wear of the tire tread is small, at the end of the brake traces not rubber particles will be found on the ground. While in the case of ordinary vehicles when between the wheels and the ground is mainly the sliding friction, tire tread wear great, the rubber particles will normally be found at the end of the brake traces.

EXPERIMENT SECTION

A bus and a car equipped with ABS make brake traces on dry high-speed road and asphalt road.

Fix large bus ABS brake traces on dry road (*Fig 1*)

Fig. 1

In the experiment, under its own weight and intermittent damping friction, the large bus braked at the speed of 45 km/h, formed clear brake traces, the investigators can shoot with conventional photography.

Fix small car ABS brake traces on dry road

First of all, compare several brake marks in the accident scene in the pictures (*Fig2 to Fig5*).

Fig. 2

The picture above shows the van without the ABS braking system which braked at speed 50km / h on asphalt, clear traces are easy to fix.

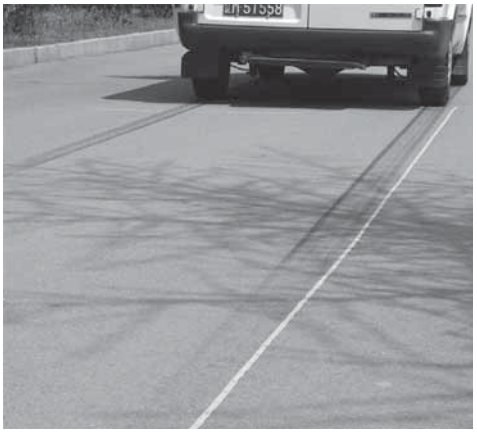

Fig. 3

The picture above shows the van braking at speed 50km / h formed brake marks on asphalt road, the vehicle rear wheels locked instantly formed a deep dragging brake traces, at the same time during the braking operation, the ABS braking system also left slight brake traces.

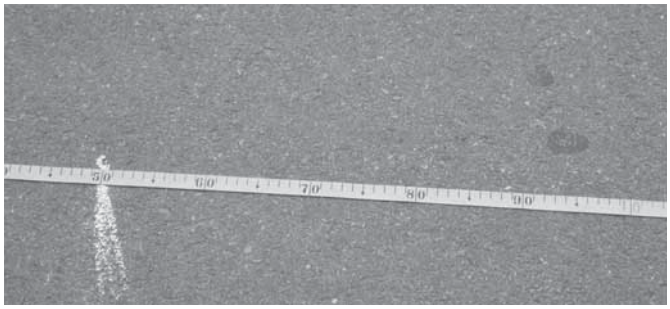

Fig. 4

In the actual shooting of ABS brake marks, we can often see the minor brake marks from side, but in the shooting, we should not shoot the brake traces in a random laterality angle, after several tests, we found available auxiliary light along the directions of traffic and traces of plane 20 ° -30 Irradiate from 20 ° -30, and the same angle on the other side, the clear brake traces can be fixed. During the process, we see the light reflection in the order of the marks as a diffuse reflection on the rough surface; the light reflection on the rubber scratches the tire traces as a mixture reflection on semi-smooth surfaces, so with the incidence light angle equal to the direction of reflection, the reflected light intensity of the trace is greater than the intensity of reflected light of the road and increasing contrast is the main reason to shoot the ABS brake traces.

We use the same method, in natural light conditions, to fix the brake traces formed at the speed of 50km / h in a high-speed road surface of Passat with the ABS braking Brake system and gain good results.

Fig. 5

The ABS brakes traces on the snow road photography collection methods

Antilock snow brake marks mostly due to the continuous rain and snow, windy weather or melted snow, heavy traffic and other factors cannot be stored for a long time. A fixed record of traces is inconvenient for investigators, so while collecting such traces, the most important task of the investigators is rushing to the scene of the accident fixing the record of traces as soon as possible. This paper analyzes several marks at the scene of the accident, select the appropriate photography to provide a reference to the investigators.

The ABS brakes traces formed in compacted snow road photography collection methods

Fig. 6

See fig 6, ABS braking system brakes drag traces and the stress of the friction and tire lines internal stress will whirl away near the snow, form strong contrasts with the surrounding snow. While the snow on the remaining portion of the lane is compacted and cannot form three-dimensional traces, so investigators can only use the conventional photographic methods to record these traces.

The ABS brake traces formed in a certain depth of natural snow road photography collection methods

Due to natural snow, a clear stereoscopic ABS brakes traces may appear. Shadow photography method can be used to fix the record. Notes in the process:

1) If conditions permit, shooting in the darkroom or cassette to eliminate interference from other light. In outdoor, avoid the sunlight at noon, and then operate under the shadow photography outdoor shooting matters.
2) Select the angle of the light distribution according to the width of the snow depth and tire traces though multiple test shot, look for the optimum light distribution angle.
3) The intersections of the tire lines are complex and changeable due to the work requirements, wear and tear, four different tire overlap prints and other reasons. The cross corner angle sub-line direction light distribution cannot get the desired effect, on the basis of the light distribution theory. Therefore, we choose single bottom static multiple exposure techniques and two or more different directions linear vertical light shadow image to enhance photographs traces layering. So a tripod and other equipment are needed to fix a camera to avoid camera shaking. Multiple exposures are needed to reduce the amount of exposure manually, to prevent overlapping, and details traces lost due to the overexposure.
4) In the acquisition process of the details marks, we should ensure the consistency in the direction of its on-site overview of photography. Label the direction of the light distribution in shooting, for future viewing the pictures in the same perspective, in order to eliminate the adverse effects of shadow illusion during the picture trace analysis.
5) See fig 7, ABS braking system brakes formed in a groove in the natural snow like stereoscopic traces. On the walls of the traces a number of trim or arc of cycloid curve, the tilt direction of the cycloid curve is the vehicle travel direction. Snow, mud, and other objects adhered to the tire shoulder, shed on both sides of the tire traces often jagged distribute, and the jagged tip point is the direction of the vehicle. So when the brake traces in snow accident scene are difficult to fix, the two derivative traces could be collected as well.

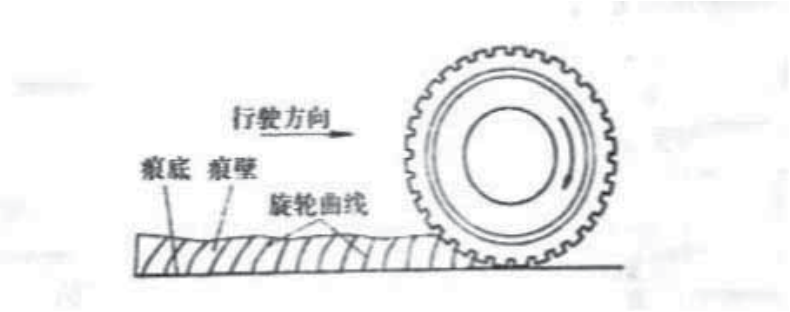

Fig. 7

Vehicles equipped with ABS braking system brake traces shooting on the rainy road and sandy road

Brake traces forming mechanism by the vehicles equipped with ABS braking systems and rainy, sandy road complex environment at the scene, make the tire traces on the road not obvious and not easy to retain or impossible to save marks. Because of the limit of the conditions, the issue is not researched and discussed in the paper. The investigators try other traces in such accident scenes to make analyses and identify further the type of a vehicle, the direction of driving and the route.

At the same time, thick clouds obscured the sun, sky scattering light intensity is high, while the ground does not get direct light brightness. The direction of the light source is not obvious, there is small light difference between the objects and scenery, photographs contrast is weak, dull, and lacks hierarchy.

So, here we have a cloudy day and night picture notes, hoping to help on-site operation of the police handling the case.

1) Select the proper shooting angle. In order to artificially increase the contrast of the photo and enhance the perspective so that it does not affect the scene, prospects settings is very important. In general, the color of the main objects is dark, light colors for the background could be chosen; if the main is light, you should choose a dark color for the background, which is the effective method to enhance the contrast of the screen.
2) Adjust the contrast by the filter. Due to the pass, restrictions and prevention of the filter to variety of lights, the filter could be used to enhance the contrast, to highlight the subject.
3) Correct exposure. If we shoot on a cloudy day, accurate exposure is the key to getting a good picture successfully. If overexposed picture level is reduced and fog degree increased, the contrast is weak. If underexposed, the low light part will lose the level, the picture is dark gray.

Notes in the night

1) Take brake traces pictures with the flash photography. The flash illumination angle is the most important thing. Appropriately select the auxiliary light selection lateral sidelight.
2) Take pictures of brake traces in a big scene so that you can use a single lamp flash method several times in succession. During the process, fix the camera on a tripod and open the door B, lock the shutter line holding the flash, spark several times according to the size of the scene. From far to near, segmented exposure.
3) If there is the fog at night, do not use the flash, because the fog will reflect the light back, nothing will appear in the picture. Then use the lighting (such as the scene investigation light), in order to eliminate the impact of the fog. The filter should not be added in front of the camera lens, while the yellow filter should be added in front of the light source and use the yellow light irradiation.

Using the spectroscopic photography method to collect blood in ABS equipped vehicle tire marks in the accident scene.

Fig. 8 Blood brake traces

Blood in the 200-900nm UV, visible and near infrared has a strong absorption action; strong absorption band of the purple light is 380-440nm wavelength, the peak absorption wavelength of 415nm.

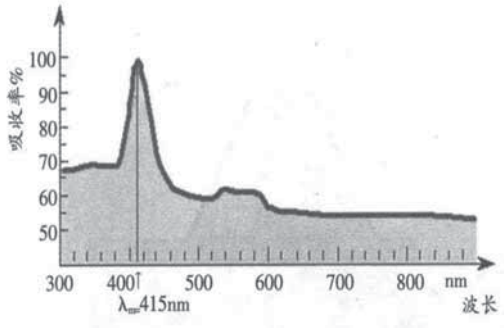

Fig. 9 Blood absorption rate

So we can choose multi-band light source color separation photography to fix the blood tire marks, incident light 415nm band light, blood traces strongly absorbed became dark, relatively light color objects, strong reflection became light-colored tone.

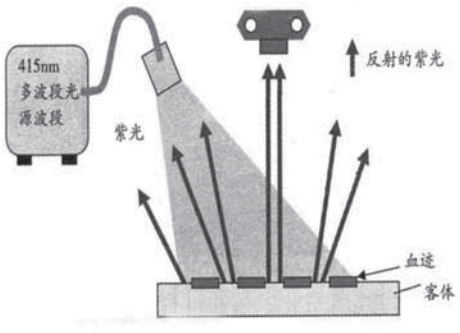

Fig. 10 The multi-band light shooting bloodstain trace device

Shooting tips

1) Shooting in the darkroom, no color filter will be added in front of the camera; if shooting was not in the completely black environment, the purple color filter should be added in front of the camera.
2) When a color filter need to add outdoor, in order to ensure the accuracy of the viewfinder and focusing on the device, should fix the camera on a stable equipment. Add the color filter after the completion of the framing and focusing, otherwise it will cause the focusing illusion.
3) Increase exposures according to the principle

Using the polarized light photography method to collect ABS equipped vehicle tire dust marks on the textiles in the accident scene.

The fabric surface is rough and prone to strong reflection or diffusion phenomena, in the ordinary light conditions. Only the blurred dust tire footprint contour vaguely observed is difficult to fix by picture. Because the dust traces and the objects can affect the polarized light in diffusion and scatter depolarization in different level, see the picture, add the polarizer in front of the artificial light, the analyzer in front of the camera lens in the process, adjust the analyzer in the horizontal direction to make the polarization axis and the polarization axis of the subject reach an appropriate angle in order to change the distribution of the brightness on the object, enhance the contrast between the traces and the object significantly, and then in the best time to shoot fix the evidence.

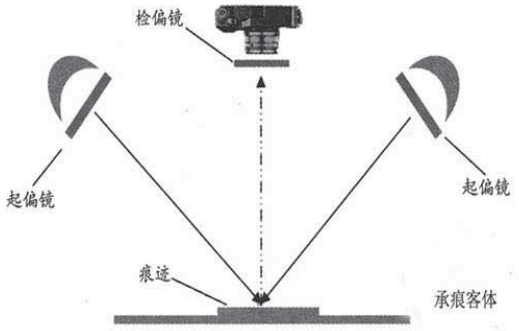

Fig. 11 Dual polarization microscopy light distribution

Shooting tips

1) If the conditions permit, in order to avoid interference from other light, the darkroom or darkroom box should be used in the shooting; fix the camera on the stable device and use a shutter line while shooting; the polarizer should be connected closely to the lens; keep an adjusted polarization axis not changed in the exposure.
2) Dual polarization microscopy have the strong ability to adjust and control the brightness distribution. The photometric light source should select the parallel beams source or point light source.
3) Panchromatic film and color film is appropriately used in the polarized light shooting. When shooting brightly colored textiles objects, the certain filter should be added to enhance the image contrast.
4) When adjusting the angle of the two polarization axes, the polarizer and analyzer increase and the light-blocking rate will increase as well, so the control of the exposure amount should be determined after several measurements.

More and more vehicles equipped with ABS make traffic accidents, and more innovation and breakthrough in the subject of shooting can fix antilock brake traces. Conclusions drawn from spe-

cial shooting style of the police evidence photography described in this paper and the popularity of a large number of anti-lock brake marks shooting fixed in experiments are as follows:

1) In the common drying road, if slight brake traces by the vehicle ABS can be seen visually, increase the contrast to fix the anti-lock brake traces by shooting.
2) For the stereoscopic brake traces on the road covered with snow formed by the vehicle with ABS, the single bottom static multiple exposure technique is used to fix the irregular multi-directional stereoscopic brake traces.
3) The ABS brake traces fade and are destroyed easily and it is difficult to fix them by shooting, so the derivative traces are more valuable to extract. Polarized photography and color separation photography are suitable to fix the dust tire traces on the textile fabric and the blood tire brake traces by shooting.

Increase contrast photography described in this paper. Side light grading photography, polarized light photography and color separation photography have been widely used in potential traces fixed by shooting, but in complex environmental conditions of the accident scene ABS brake traces, it is still on the exploratory stage. Although the experimental results show that practical applications of these types of shooting fixation methods in the corresponding feasibility in certain environmental conditions, changing the environment or shooting conditions cannot be met, the clear stability of the ABS brake traces evidence fixed by shooting will influence largely.

REFERENCES

1. Pan Guoguang. Criminal Photography Tutorial [M].People's Public Security University of China Press. 2002
2. Qian Jun: Simple Tutorial of Criminal Photography [M]. People's Public Security University of China Press. 2002
3. Zhu Baoli. Physical Evidence Verification Photography Tutorial M].Beijing Policeman Education Press, 1999
4. Zhuang Hua, Huang Zhiming: Dichroism Polarization Photography by Digital Camera [J].Criminal Technology, 2005 (2).
5. Su Weifang: Training Tutorial of Criminal Image and Video Technique [M]. People's Public Security University of China Press. 2010
6. Zhang Shujie, Zhang Chunliang. Trace Verification Volume of Chinese Criminal Science and Technique Collection [M]. People's Public Security University of China Press. 2004

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535.243

EVALUATION OF MEASUREMENT UNCERTAINTY FOR DETERMINING NH_4^+ IN EXPLOSION SOIL SAMPLES BY ULTRAVIOLET SPECTROPHOTOMETRY METHOD

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Abstract: In this work, evaluation of measurement uncertainty for determining NH_4^+ in explosion soil samples was developed as a methodology. Based on simple experimental design and statistics, the method validation procedure was also proposed. The sources of measurement uncertainty for determination of NH_4^+ in explosion soil samples using the ultraviolet spectrophotometry method were analyzed and discussed in detail, and the measurement uncertainty was calculated and evaluated. We also quantified the uncertainty components, calculating the combined standard uncertainty and the expanded uncertainty, obtaining the relatively comprehensive quantitative analytical report. The expanded uncertainty of NH_4^+ in the explosion soil samples was U= k·u(c)=2×32=64 μg/g, after deducting the blank, the amount content of NH_4^+ in the explosion soil samples was: C=1850±64 μg/g. The results showed that the proposed method can be applied to efficiently monitor the process of determination of NH_4^+ utilized by the ultraviolet and visible spectrophotometry.

Keywords: ultraviolet spectrophotometry method; soil samples; NH_4^+; uncertainty.

INTRODUCTION

In chemical metrology, quality and the reliability of results of quantitative analyses have the decisive impact on the analytical method. Uncertainty of determination has attracted tremendous attentions in the last decades because it was an essential component of the measures which could help a laboratory to produce reliable analytical data. Systematic and random measurement of errors has for a long time been regarded as the cause for more or less exact determination[1], [2]. Nowadays, wherever possible and practical, the performance characteristics of analytical methods used for process monitoring or control of regulation limits should be evaluated[3]. Generally speaking, it is also important to have reliability of the results in the international trade and analytical results should be acceptable to all users within the country or outside the country[4].

In the crime scene investigation and identification of explosion accidents which occurred in criminal cases, public security threats and the production. It is necessary not only to carry out an NH_4^+ qualitative analysis, but also the quantitative analysis, in order to provide evidence for criminal investigation and lawsuit trial. In court identification cases, whenever decisions are based on analytical results, it is important to have some indication of the quality of the results[5]. By definition,

1 Kessel W. Measurement uncertainty according to ISO/BIPM-GUM. Thermochim. Acta, 2002, 382:1–6.
2 Drolc A, Pintar A. Measurement uncertainty evaluation and in-house method validation of the herbicide iodosulfuron-methyl-sodium in water samples by using HPLC analysis [J]. Accred Qual.Assur., 2011, 16, 21-29.
3 Drolc A, Pintar A. Method validation and measurement uncertainty evaluation for measurement of mass concentration of organic acids in fermentation broths by using ion chromatography[J]. Accred Qual.Assur., 2012, 17, 323-330.
4 Singh N, Ojha V, Kayal, etal. Quantifying uncertainty in the measurement of arsenic in suspended particulate matter by Atomic Absorption Spectrometry with hydride generator [J]. Chem. Cent. J., 2011, 5(17): 2-12.
5 EURACHEM, The fitness for Purpose of analytical Methods (1998) (ISBN O-948926-12-0)

measurement uncertainty is a parameter characterizing the dispersion of the quantity values being attributed to the measured, based on the information used[6].

The evaluation of uncertainty requires the scientific and technological workers to pay close attention to all the possible sources of uncertainty. It is essential that great attention is paid to a detailed study of this metrology. However, considerable effort may be required. In practice, the most significant sources of uncertainty should be subject of a preliminary study and quickly identified. It was showed that the value obtained from the combined uncertainty is mainly controlled by the major contributions. A good estimate of uncertainty can be made by concentrating effort on the largest contributions[7]. In the last several years uncertainty measurement have been carried in different materials by using different techniques[8], [9], [10], [11], [12], but there is only little information in forensic science. To the best of our knowledge, there are only a few reported on the qualification of solid samples uncertainty utilizing the ultraviolet and visible spectrophotometry.

In practice, analytical measurements essentially call for consideration of uncertainties associated with elements of overall method performance. The main sources of uncertainty can be proposed as instrument effects, reagent purity, measurement conditions, computational effects, operator effects, and random effects. Instrument effects usual include the limits of accuracy on the calibration of a special electronic balance, the stability and accuracy of analytical instrumental within specification. All of reagents are not 100% pure and can contain isomers and inorganic salts. Generally speaking, the purity of such substances is usually stated by manufacturers as being not less than a specified level, which contains assumptions about the degree of purity. It will introduce an element of uncertainty. Glass apparatus were commonly used at an ambient temperature different from that at which it was calibrated. Temperature of glass apparatus and liquid effects should be considered. Using calibration curve as the calibration model, it may lead to poorer fit and higher uncertainty. Everyone's reading a meter or scale and interpretation of the method will be of slightly differences, which also could introduce uncertainty. Random effects are introduced into the uncertainty associated with the test consistently.

The sources of measurement uncertainty for determination of NH_4^+ in explosion soil samples by ultraviolet spectrophotometry method were analyzed and discussed in detail, and the measurement uncertainty was calculated and evaluated. We also quantified the uncertainty components, calculating the combined standard uncertainty and the expanded uncertainty, obtaining the relatively comprehensive quantitative analytical report. The expanded uncertainty of NH_4^+ in the explosion soil samples were $U= k \cdot u(c)=2\times32=64$ μg/g, after deducting the blank, the amount content of NH_4^+ in the explosion soil samples were: C=1850±64 μg/g. The results showed that the proposed method can be applied to efficiently monitor the process of determination NH_4^+ utilized by the ultraviolet and visible spectrophotometry. In criminal cases, public security case and the production of accident of explosion of crime scene investigation and identification, not only to NH_4^+ qualitative analysis, but also to undertake quantitative analysis, for criminal investigation and lawsuit trial provide evidence. At the same time, it provides a value reference and idea for the qualification of solid samples uncertainty utilized by the ultraviolet and visible spectrophotometry.

6 International Vocabulary of basic and general terms in Metrology. ISO, Geneva, (1993). (ISBN 92-67-10175-1)
7 Ellison SLR, Rosslein M, Williams A. EURACHEM/CITAC, Quantifying uncertainty in analytical measurement, 2000, 2nd, edn. LGC, Teddington.
8 Synek V, Subrt P, Marecek J. Uncertainties of mercury determinations in biological materials using an atomic absorption spectrometer: AMA 254 [J].Accred Qual.Assur., 2000,5(2) :58-66.
9 Kayal N, Singh Nahar, Ojha VN, etal. Evaluation and expression of uncertainty in the determination of alumina in deodorants by complexometric method. Test and Eva (ASTM), 2009, 37: 321-328.
10 Kumar AR, Riyazuddin P. Underestimation of total arsenic concentration in groundwater samples determined by hydride generation quartz furnace atomic absorption spectrometry due to sample characteristics [J].Accred Qual Assur, 2007,12:455-458.
11 Kayal N, Singh N. The quantitative estimation of silica in rice husk ash by titrimetric method: A case study for uncertainty calculation. Mapan[J]. A Journal of Metrology Society of India, 2010, 25(2):115-123.
12 Koort E, Herodes K, Pihl V, etal. Estimation of uncertainty in pKa values determined by potentiometric titration [J]. Anal. Bioanal. Chem. 2004, 379, 720–729.

EXPERIMENTAL SECTION

Instruments and Reagents:

Absorption spectra were recorded on a UV-2550 spectrometer (Shimadzu Corporation); All chemicals reagents used in the experiments were of analytical grade obtained commercially without further purification; Double distilled water was used throughout the experiments; Mass measurements were weighted using a special electronic balance (Switzerland Mettler); NH_4Cl and the filter paper were dried for 3 hours in an oven at 105°C before sampling to remove moisture if any and to get constant weight.

The reference standards stock solution (100 μg/ml): 0.2972 g dried NH_4Cl was weighed accurately. Then, the solutions were transferred into 100 ml volumetric flask, diluted to mark with distilled water.

Experimental Principle:

In the presence of sodium potassium tartrate, nessler reagent as chromogenic reagent, chromogenic reactions was generated with formation of yellow solution, and then carry out quantitative determination according to the maximum absorbance at 410 nm.

Experimental Method:

0.00, 0.05, 0.10, 0.20, 0.40, 0.80, and 1.00 ml of 100 μg/ml NH_4^+ standard solutions were added to 10 ml colorimetric tubes, respectively. Then transfer 0.30 ml sodium potassium tartrate into every colorimetric tube. 0.30 ml nessler reagent was added into every tube, well mixed, and the total volume of the mixed solution was made up to 10 ml with double distilled water. Concentration of NH_4^+ was 0.0, 0.5, 1.0, 2.0, 4.0, 8.0, and 10.0 μg/ml, respectively. The absorbance intensity of the solution was recorded at 410 nm.

Sample Handling:

Explosion soil samples of 2 g was weight accurately, using distilled water extraction for 3 times, every time for 5~10 min, water extract were combined and filtered, and the solution were made up to 50 ml in a volumetric flask. The optimum way of coloration was obtained as follows: 1.0 ml determined solution was added to 10-ml colorimetric tube. Then 0.30 ml sodium potassium tartrate and 0.30 ml nessler reagent were added subsequently and well mixed, the solution was detected at wavelength of 410 nm.

THE PROCESS OF MEASUREMENT UNCERTAINTY ESTIMATION

The steps of process of measurement uncertainty estimation involved are:

(1) Build mathematical model

In order to make a clear statement of what is being measured, a detailed description of the measured was established including the relationship between the measured and the input quantities.

(2) Identify uncertainty sources

Identify the possible sources of uncertainty including sources that contribute to the uncertainty on the parameters in the relationship specified in Step 1, such as some chemical assumptions.

(3) Quantifying uncertainty sources

Having identified the uncertainty sources as explained in Step 2, the next step is to quantify the uncertainty arising from these sources. This can be done by evaluating the uncertainty arising from each individual source and then combining them. It is essential to estimate a single contribution to uncertainty associated with a number of separate sources as well as consider whether available data accounts sufficiently for all sources of uncertainty.

(4) Calculating the Combined Uncertainty

Where the uncertainty component was evaluated experimentally from the dispersion of repeated measurements, it can readily be expressed as a standard deviation. The contributions have combined according to the appropriate rules, to give a combined standard uncertainty. The appropriate coverage factor should be applied to give an expanded uncertainty.

BUILD MATHEMATICAL MODEL

In order to make a clear statement of what is being measured, a detailed description of the measured was established including the relationship between the measured and the input quantities. Mathematical model were build so as to identify the main sources of uncertainty in the measurement. Both of models of combined standard uncertainty of NH_4^+ in determined solution and the combined standard uncertainty of NH_4^+ in explosion soil samples were build respectively.

(1) Build standard calibration curve

$$y=ax+b$$
$$x=(y-b)/a$$

where; y: Absorbance(A), a: Slop of calibration curve, b: Intercept of calibration curve, x: the concentration of NH_4^+ in determined solution (μg/ml).

Hereby, the combined standard uncertainty of NH_4^+ in determined solution:

$$u(x)=\sqrt{(\frac{\partial x}{\partial y})^2u^2(y)+\frac{\partial x}{\partial a})^2u^2(a)+(\frac{\partial x}{\partial b})^2u^2(b)}=$$
$$\sqrt{\left[\frac{1}{a}\cdot u(y)\right]^2+\left[-\frac{y-b}{a^2}\cdot u(a)\right]^2+\left[-\frac{1}{a}\cdot u(b)\right]^2}$$

(2) Build mathematical model

The content of NH_4^+ in soil samples $c(\mu g/g)=\frac{\Delta x\cdot V_{10}}{m\cdot L}$, that is, the combined standard uncertainty of NH_4^+ in explosion soil samples:

$$u(c)=\left\{\left[\frac{\partial c}{\partial x}\cdot u(\Delta x)\right]^2+\left[\frac{\partial c}{\partial V_{10}}\cdot u(V_{10})\right]^2+\left[\frac{\partial c}{\partial m}\cdot u(m)\right]^2+\left[\frac{\partial c}{\partial L}\cdot u(L)\right]^2\right\}^{1/2}=$$
$$\left\{\left[\frac{V_{10}}{m\cdot L}\cdot u(\Delta x)\right]^2+\left[\frac{\Delta x}{m\cdot L}\cdot u(V_{10})\right]^2+\left[-\frac{\Delta x\cdot V_{10}}{m^2\cdot L}\cdot u(m)\right]^2+\left[-\frac{\Delta x\cdot V_{10}}{m\cdot L^2}\cdot u(L)\right]^2\right\}^{1/2}$$

Where; c: Content of NH_4^+ after deduction blank in explosion soil samples; Δx: Content of NH_4^+ after deduction blank in determined solution; m: Mass of explosion soil samples; V_{10}: 10-ml colorimetric tube; points to take over: 1 ml/50 ml.

IDENTIFY UNCERTAINTY SOURCES

Identify the possible sources of uncertainty including sources that contribute to the uncertainty on the parameters in the relationship specified in Step 2, such as some chemical assumptions. In practice, it is more usual in analytical measurement to consider uncertainties associated with elements of overall method performance.

The different uncertainty sources and their influence on the measured are analyzed in details. The typical sources of uncertainty are analyzed as bellows:

The uncertainty sources mainly contained uncertainty of NH_4^+standard reserving solution u_{y-1}, uncertainty from samples weight u(m), uncertainty from spectrometer u_{y-2}, uncertainty from calibration curve u_{y-3}, uncertainty from repeated measurements u(rep), uncertainty from points to take over u(L).

(1) Uncertainty of NH_4^+standard reserving solution u_{y-1}:

In the section, it mainly contains uncertainty of purity u (p), uncertainty of weighing u (m_0), uncertainty from volumetric flask, colorimetric tube, and pipette. Combined uncertainty of purity u_{rel} (p), uncertainty of weighing u_{rel} (m_0), and uncertainty of volume u_{rel} (v) contributions, receiving the uncertainty of NH_4^+ standard reserving solution.

(2) Uncertainty from samples weight u (m):

According to the balance verification certificate, it quotes ±0.2 mg for the uncertainty. The linearity contribution is assumed to show a rectangular distribution. Based on the above information it can be converted to a standard uncertainty.

(3) Uncertainty from spectrometer u_{y-2}

Absorption spectra were recorded on a UV-2550 spectrometer of Shimadzu Corporation, which was used for the demand of quantitative determination. According to verification certificate of spectrometer, at the same time, the linearity contribution is assumed to show a rectangular distribution and could be converted to a standard uncertainty.

(4) Uncertainty from calibration curve u_{y-3}

Under the optimal conditions, the relationship between concentration of NH_4^+ and the absorption intensity was established. According to absorption intensity in concentration dependence we can obtain a calibration curve. The results show that the change of absorption intensity and the concentration of NH_4^+ possess a good linear relationship in the concentration range from 0.5 to 10 μg/ml. The correlation coefficient was 0.9997. The uncertainty from calibration curve consists mainly of uncertainty of y residual, slop a, and uncertainty of intercept b.

(5) Uncertainty from repeated measurements u(rep)

In order to make the analysis and testing results are true and reliable, generally using repeated measurement mode, in which the same operator at the same laboratory using the same instrument according to the required steps of analysis method, in continuous time, the samples were through repeated measurements, this process will introduce uncertainty. According to the results of determined substance, calculate the relative standard deviation S, then we can obtain the uncertainty from repeated measurements u(rep).

(6) Uncertainty from points to take over u(L)

1 ml pipette with B grade, 50 ml volumetric flask with A grade at the temperature of 20 °C was known, taking the derivative the standard uncertainty was obtained.

Based on the conclusion, the expanded uncertainty of NH_4^+ in the explosion soil samples and the amount content of NH_4^+ in the explosion soil samples were calculated after deducting the blank using a coverage factor of 2 with a level of confidence of approximately 95%.

QUANTIFYING UNCERTAINTY SOURCES

Having identified the uncertainty sources, the next step is to quantify the uncertainty arising from these sources. This can be done by evaluating the uncertainty arising from each individual source and then combining them. It is essential to estimate a single contribution to uncertainty associated with a number of separate sources as well as consider whether available data accounts sufficiently for all sources of uncertainty.

Uncertainty of NH_4^+ Standard Reserving Solution u_{y-1}

(1) Uncertainty of purity u (p)

Purity of ammonium chloride is given in the supplier's certificate as 0.9996. The quoted uncertainty is taken as a rectangular distribution, so the standard uncertainty u(P) is

$$u(P) = \frac{0.0004}{\sqrt{3}}$$

(2) Uncertainty of weighing u (m_0)

NH_4Cl 0.2972 g was weighed accurately, the balance verification certificate quotes ±0.2 mg for the uncertainty. The linearity contribution is assumed to show a rectangular distribution and is converted to a standard uncertainty:

$$u(m_0) = \frac{0.2\ \text{mg}}{\sqrt{3}} = 0.115\ \text{mg}$$

$$u_{rel}(m_0) = \frac{u(m_0)}{m_0} = 3.9 \times 10^{-4}$$

(3) Uncertainty from volumetric flask, colorimetric tube, and pipette

According to verification certificate, 1000 ml volumetric flask with A grade given by the certificate (±0.40 ml) and approximated to a triangular distribution

$$u_1(1000_1) = \frac{0.40\ \text{ml}}{\sqrt{3}} = 0.23\ \text{ml}$$

According to calibration information, volumetric flask, colorimetric tube, and pipette were all calibrated at a temperature of 20°C. The temperature of the laboratory is within the limits of ±5°C. The uncertainty from this effect can be calculated from the estimate of the temperature range and the coefficient of the volume expansion. Volume expansion coefficient for water was 2.1×10^{-4} °C^{-1}, which leads to a volume variation of:

$$u(\Delta V) = 1000\times5\times2.1\times10^{-4} = 1.05\ \text{ml}$$

The standard uncertainty is calculated using the assumption of a rectangular distribution for the temperature variation

$$u(\Delta 1000) = \frac{1.05\ \text{ml}}{\sqrt{3}} = 0.61\ \text{ml}$$

The two contributions are combined to give the standard uncertainty u(1000) of 1000 ml volumetric flask:

$$u(1000) = \sqrt{u_1^2(1000_1) + u^2(\Delta 1000)} = 0.65\ \text{ml}$$

$$u_{rel}(1000) = 6.5 \times 10^{-4}$$

1 ml pipette with B grade, 10 ml colorimetric tube with A grade and 50 ml volumetric flask with A grade given by the verification certificate (±0.015 ml, ±0.02 ml and ±0.05 ml) at the temperature of 20C and approximated to a triangular distribution, the standard uncertainty was:

$$u_{rel}(1) = 8.7 \times 10^{-3}$$
$$u_{rel}(10) = 1.3 \times 10^{-3}$$
$$u_{rel}(50) = 8.4 \times 10^{-4}$$
$$u_{rel}(\mathrm{v}) = \sqrt{u_{rel}^2(1) + u_{rel}^2(10) + u_{rel}^2(50) + u_{rel}^2(1000)} = 8.9 \times 10^{-3}$$

Combining uncertainty of purity $u_{rel}(p)$, uncertainty of weighing $u_{rel}(m_0)$, and uncertainty of volume $u_{rel}(v)$ contributions, Uncertainty of NH4+ standard storage solution were:

$$u_{y\text{-}1} = \sqrt{u_{rel}^2(\mathrm{p}) + u_{rel}^2(\mathrm{m}_0) + u_{rel}^2(\mathrm{v})} = 8.9 \times 10^{-3}$$

Uncertainty from Samples Weight u (m)

NH_4Cl 2.1201g was weighed accurately, the balance verification certificate quotes ±0.2 mg for the uncertainty. The linearity contribution is assumed to show a rectangular distribution and is converted to a standard uncertainty:

$$u(\mathrm{m}) = \frac{0.2\ \mathrm{mg}}{\sqrt{3}} = 0.115\ \mathrm{mg}$$
$$u_{rel}(\mathrm{m}) = \frac{u(\mathrm{m}_0)}{\mathrm{m}_0} = 5.4 \times 10^{-3}$$

Uncertainty from Spectrometer $u_{y\text{-}2}$

Absorption spectra were recorded on a UV-2550 spectrometer (Shimadzu Corporation), which was used for the demand of quantitative determination. According to verification certificate of spectrometer, uncertainty was 1.6% (k=3), the linearity contribution is assumed to show a rectangular distribution and is converted to a standard uncertainty:

$$u_{rel}(\text{y-2}) = 0.0053$$

Uncertainty from Calibration Curve $u_{y\text{-}3}$

Under the optimal conditions mentioned before, we established relationship between concentration of NH_4^+ and the absorption intensity. It was found that absorption intensity in a concentration dependence that was fit for the conventional Stern-Volmer plot. Herein, least squares fit is done between absorption intensity and the concentration of NH_4^+ to obtain calibration curve: y=0.1891x+0.0112, where, the absorption intensity of series NH_4^+ standard solutions was shown in table 1, calibration curve was shown in figure 1.The results show that the change of absorption intensity and the concentration of NH_4^+ possess a good linear relationship in the concentration range from 0.5 to 10 μg/ml with a correlation coefficient of 0.9997. The uncertainty from calibration curve consists mainly of uncertainty of y residual, slop a, and uncertainty of intercept b.

(1) Uncertainty from y residual u(y)

$$u_{y\text{-}3} = S_{y\text{-}3} = \sqrt{\frac{\sum_{l=1}^{n}\sum_{j=1}^{m}(y_{ij} - y_l)^2}{m \cdot n - 2}} = 0.015$$
$$u_{rel}(\text{y-3}) = \frac{S_{y\text{-}3}}{\mathrm{y}} = 0.010$$

Where, x: concentration of series NH_4^+ standard solutions(μg/ml); y_i: determined absorption intensity(A); y_{ij}: obtained absorption intensity after regression (A); m: repeated measurement times for each concentration of standard solution; n: number of solution measurements. Calculation was according to the process of sample determination y=1.45, x=7.6 μg/ml.

Various components include u(y-1), u(y-2), and u(y-3) were uncorrelated, respectively, in the process of samples determination uncertainty from absorption y was:

$$u_{rel}(y)=\sqrt{u_{rel}^2(y\text{-}1)+u_{rel}^2(y\text{-}2)+u_{rel}^2(y\text{-}3)}=\sqrt{(8.9\times10^{-3})^2+0.0053^2+0.010^2}=0.010$$

$$u(y)=0.015\ A$$

(2) Uncertainty from slop a

$$u_a=\frac{s}{\sqrt{\sum_{i=1}^{n}(x_i-\bar{x})^2}}=1.7\times10^{-3}\ A/(\mu g/ml)$$

The determined sample solution was measured 5 times; absorption intensity was 1.45, 1.46, 1.44, 1.45, and 1.45 respectively. Mean value of the different absorption intensity were

$$\bar{y}=1.45A,$$

Herein, reflection coefficients were $\frac{\partial x}{\partial a}=-\frac{\bar{y}-b}{a^2}=-40.2\ (\mu g/ml)^2/A$

(3) Uncertainty from intercept b

$$u_b=S_{y-3}\sqrt{\frac{\sum_{i=1}^{n}x_i^2}{n\cdot m\cdot\sum_{i=1}^{n}(x_i-\bar{x})^2}}=5.5\times10^{-3}\ A$$

Herein, reflection coefficients were $\frac{\partial x}{\partial b}=-\frac{1}{a}=-5.3\ (\mu g/ml)/A$

Uncertainty from Repeated Measurements

In order to make the analysis and testing results are true and reliable, generally using repeated measurement mode, in which the same operator at the same laboratory using the same instrument according to the required steps of analysis method, in continuous time, the samples were through repeated measurements, this process will introduce uncertainty. According to the results of determined substance, calculate the relative standard deviation S; then we can obtain the u (repeatability)

$= S/\sqrt{n}$, By 3.4 (2) know, $\bar{y}=1.45$ A (n=5).

$$s=\sqrt{\frac{\sum_{i=1}^{n}(y_i-\bar{y})^2}{n-1}}=7.1\times10^{-3}A$$

$$u(\text{repeatability})=3.2\times10^{-3}A$$

$$u_{rel}(\text{repeatability})=2.2\times10^{-3}$$

Uncertainty from Points to Take Over u(L)

1 ml pipette with B grade, 50 ml volumetric flask with A grade at the temperature of 20 °C, the standard uncertainty was:

$$u(1) = 8.7 \times 10^{-3} \text{ ml}$$
$$u(50) = 0.042 \text{ ml}$$
$$L = V_1 / V_{50}$$

$$u(L) = \sqrt{(\frac{\partial L}{\partial V_1})^2 u^2(V_1) + (\frac{\partial L}{\partial V_{50}})^2 u^2(V_{50})} =$$
$$\sqrt{\left[\frac{1}{V_{50}} \cdot u(V_1)\right]^2 + \left[-\frac{V_1}{V_{50}^2} \cdot u(50)\right]^2} =$$
$$\sqrt{\left[\frac{1}{50} \times 8.7 \times 10^{-3}\right]^2 + \left[-\frac{1}{50^2} \times 0.042\right]^2} = 1.7 \times 10^{-4}$$

Table 1. Absorbance of series of standard NH_4^+.

Serial No.	Content of standard NH_4^+ value x_i (μg/ml)	Absorbance measured y_{ij} (A)			Average (A)	Regression y_i (A)	Results of regression
1	0.5	0.098	0.097	0.099	0.098	0.106	
2	1.0	0.191	0.191	0.191	0.191	0.200	
3	2.0	0.413	0.412	0.411	0.412	0.389	a=0.1891 b=0.0112 r=0.9997
4	4.0	0.758	0.759	0.757	0.758	0.768	
5	8.0	1.541	1.543	1.542	1.542	1.524	
6	10.0	1.888	1.889	1.890	1.889	1.902	

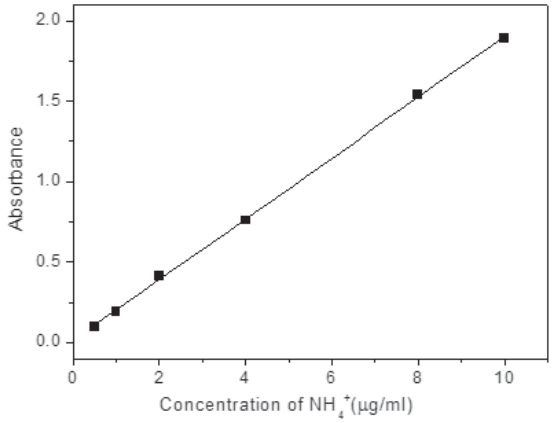

Figure 1. Relationship between concentration of NH_4^+ and absorbance.

Uncertainty from NH_4^+ in Determined Solution

$$u(x)=\sqrt{(\frac{\partial x}{\partial y})^2u^2(y)+\frac{\partial x}{\partial a})^2u^2(a)+(\frac{\partial x}{\partial b})^2u^2(b)}=$$

$$\sqrt{\left[\frac{1}{a}\cdot u(y)\right]^2+\left[-\frac{y-b}{a^2}\cdot u(a)\right]^2+\left[-\frac{1}{a}\cdot u(b)\right]^2}=$$

$$\sqrt{\left[5.3\times0.015\right]^2+\left[-40.2\times1.7\times10^{-3}\right]^2+\left[-5.3\times5.5\times10^{-3}\right]^2}=0.11\mu g/ml$$

Uncertainty from NH_4^+ in Explosion Soil Samples

$$u(c)=\left\{\left[\frac{\partial c}{\partial\Delta x}\cdot u(\Delta x)\right]^2+\left[\frac{\partial c}{\partial V_{10}}\cdot u(V_{10})\right]^2+\right.$$

$$\left.\left[\frac{\partial c}{\partial m}\cdot u(m)\right]^2+\left[\frac{\partial c}{\partial L}\cdot u(L)\right]^2\right\}^{1/2}=$$

$$\left\{\left[\frac{V_{10}}{m\cdot L}\cdot u(\Delta x)\right]^2+\left[\frac{\Delta x}{m\cdot L}\cdot u(V_{10})\right]^2+\right.$$

$$\left.\left[-\frac{\Delta x\cdot V_{10}}{m^2\cdot L}\cdot u(m)\right]^2+\left[-\frac{\Delta x\cdot V_{10}}{m\cdot L^2}\cdot u(L)\right]^2\right\}^{1/2}=$$

$$\left\{\left[\frac{10}{2\times(1/50)}\times0.11\right]^2+\left[\frac{7.4}{2\times(1/50)}\times1.3\times10^{-2}\right]^2+\right.$$

$$\left.\left[-\frac{7.4\times10}{2^2\times(1/50)}\times0.115\times10^{-3}\right]^2+\left[-\frac{7.4\times10}{2\times(1/50)^2}\times1.7\times10^{-4}\right]^2\right\}^{1/2}=32\mu g/g$$

Reporting Uncertainty

Where the uncertainty component was evaluated experimentally from the dispersion of repeated measurements, it can readily be expressed as a standard deviation. The contributions have combined according to the appropriate rules, to give a combined standard uncertainty. The appropriate coverage factor should be applied to give an expanded uncertainty.

The expanded uncertainty of NH_4^+ in the explosion soil samples were U=k·u(c)=2×32=64 μg/g, After deducting the blank, the amount content of NH_4^+ in the explosion soil samples were: C=1850±64 μg/g.

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

CONCLUSIONS

The sources of measurement uncertainty for determination of NH_4^+ in explosion soil samples by ultraviolet spectrophotometry method were analyzed and discussed in detail, and the measurement uncertainty was calculated and evaluated. We also quantified the uncertainty components, calculating the combined standard uncertainty and the expanded uncertainty, obtaining the relatively comprehensive quantitative analytical report. The expanded uncertainty of NH_4^+ in the explosion soil samples were U= k·u(c)=2×32=64 μg/g, after deducting the blank, the amount content of NH_4^+ in the explosion soil samples were: C=1850±64 μg/g. The results showed that the proposed method

can be applied to efficiently monitor the process of determination NH_4^+ utilized by the ultraviolet and visible spectrophotometry.

In actual operation, drawing the calibration curve is the main factor controlling the final result. In the process of constant laboratory quality control analysis under normal conditions, if the determination method was unchanged, the result is quite reliable. In criminal cases, public security cases and the production accidents, it is essential to carry out a crime scene investigation and identification, not only by NH_4^+ qualitative analysis, but also to undertake quantitative analysis, to provide evidence for criminal investigation and subsequent legal proceedings. At the same time, it provides a value reference and the idea for the qualification of solid samples uncertainty utilized by the ultraviolet and visible spectrophotometry.

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REFERENCES

1. Drolc A, Pintar A. Measurement uncertainty evaluation and in-house method validation of the herbicide iodosulfuron-methyl-sodium in water samples by using HPLC analysis [J]. Accred Qual.Assur., 2011, 16, 21-29.
2. Drolc A, Pintar A. Method validation and measurement uncertainty evaluation for measurement of mass concentration of organic acids in fermentation broths by using ion chromatography [J]. Accred Qual.Assur., 2012, 17, 323-330.
3. Ellison SLR, Rosslein M, Williams A. EURACHEM/CITAC, Quantifying uncertainty in analytical measurement, 2000, 2nd edn. LGC, Teddington.
4. EURACHEM, The fitness for Purpose of analytical Methods (1998). (ISBN O-948926-12-0)
5. International Vocabulary of basic and general terms in Metrology. ISO, Geneva, (1993). (ISBN 92-67-10175-1)
6. Kayal N, Singh Nahar, Ojha VN, etal. Evaluation and expression of uncertainty in the determination of alumina in deodorants by complexometric method. Test and Eva (ASTM), 2009, 37: 321-328.
7. Kayal N, Singh N. The quantitative estimation of silica in rice husk ash by titrimetric method: A case study for uncertainty calculation. Mapan[J]. A Journal of Metrology Society of India, 2010, 25(2):115-123.
8. Kessel W. Measurement uncertainty according to ISO/BIPM-GUM. Thermochim. Acta, 2002, 382:1–6.
9. Koort E, Herodes K, Pihl V, etal. Estimation of uncertainty in pKa values determined by potentiometric titration [J]. Anal. Bioanal. Chem. 2004, 379, 720–729.
10. Kumar AR, Riyazuddin P. Underestimation of total arsenic concentration in groundwater samples determined by hydride generation quartz furnace atomic absorption spectrometry due to sample characteristics [J].Accred Qual Assur, 2007,12:455-458.
11. Singh N, Ojha V, Kayal, etal. Quantifying uncertainty in the measurement of arsenic in suspended particulate matter by Atomic Absorption Spectrometry with hydride generator [J]. Chem. Cent. J., 2011, 5(17): 2-12.
12. Synek V, Subrt P, Marecek J. Uncertainties of mercury determinations in biological materials using an atomic absorption spectrometer: AMA 254 [J].Accred Qual.Assur., 2000,5(2) :58-66.

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TIRE IMPRESSIONS FEATURE EXTRACTION AND MATCHING ALGORITHM BASED ON SIFT

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Abstract: Scale-Invariant Feature Transform (SIFT) combines scale-space theory and feature detection, geared toward a broad variety of applications in the field of computer vision, such as object recognition and stereo correspondence. Therefore, in this paper, we introduced a tire impressions feature matching algorithm based on SIFT. Firstly the characteristics of the SIFT method were analyzed from a theoretical standpoint. Then the features extracted by SIFT method were applied to match tire impressions images on the criterion of the nearest neighbor based on Euclidean distance. A suggestion value bound was given by comparing the matching result of different threshold for the tire impressions image. The results of experiment show that false non-match rate is 0.2% when corresponding point pairs are 15. Besides, the matching accuracies are all equal or close to 100% when the value of rank is 16. These results prove that the features extracted by SIFT method have excellent adaptive and accurate characteristics for the tire impressions.

Keywords: tire impressions, feature extraction, feature matching, scale invariant feature transform.

INTRODUCTION

The tire impressions recognition is becoming increasingly important for many applications including traffic accident treatment, identification of tires and reference type of the suspects' vehicle(s). One of the most difficult problems is that the process of identifying a tire from tread pattern impressions has to be performed differently for each image, because there are so many conflicting factors altering impressions appearance. How to extract image feature from tire impressions and match two tire impressions is the most difficult step for the tire impression recognition. Traditional methods of image matching include spatial and frequency domains which show certain disadvantages [1], for example time-consuming, maladjustments to image rotation [2].

Compared with traditional matching methods, the approach of Scale-Invariant Feature Transform (SIFT) which extracted the invariant features from images can be used to perform a reliable matching between different views of an object or scene [3],[4],[5],[6]. The features have been shown to be invariant to the image rotation and scale and robust across a substantial range of affine distortion, addition of noise, and change in illumination. So, our implementation focuses on deriving SIFT features from an image and trying using these features to perform tire impressions identification. The approach is efficient on feature extraction and has the ability to identify large numbers of features. Our method is implemented as the following stages: Creating the Difference of Gaussian Pyramid, keypoint Detection, keypoint Elimination, Orientation Assignment, Descriptor Computation, keypoints matching. The experiment result has shown that the features extracted and matching by SIFT method have excellent adaptive and accurate characteristics for the tire impressions.

CREATING THE DIFFERENCE OF GAUSSION PYRAMID

The scale domain which is first proposed by Iijima in 1962 can be used to process image at different scales. In the work of Witkin and Koenderink [7], the approach of the scale domain is extensively adopted in digital image processing.

The first stage is to construct a Gaussian "scale space" function from the input image [8]. This is formed by convolution (filtering) of the original image with Gaussian functions of varying widths. The difference of Gaussian (DoG), D(x, y, σ), is calculated as the difference between two filtered images, one with k multiplied by scale of the other.

$$D(x, y, \sigma) = L(x, y, k\sigma) - L(x, y, \sigma) \qquad (1)$$

These images, L (x, y, s), are produced from the convolution of Gaussian functions, G(x, y, kσ), with an input image, I(x, y).

$$L(x, y, \sigma) = G(x, y, \sigma) * I(x, y) \qquad (2)$$

$$G(x, y, \sigma) = \frac{1}{2\pi\sigma^2} e^{-(x^2+y^2)/2\sigma^2} \qquad (3)$$

where s is a width factor. This is the approach we use in the implementation. First, the initial image, I, is convolved with a Gaussian function, G_0, of width s_0. Then we use this blurred image, L_0, as the first image in the Gaussian pyramid and incrementally convolve it with the next scale Gaussian, G_i, of width s_i, to create the ith image in the image pyramid, which is equivalent to the original image filtered with a Gaussian G_k, of width ks_0. The effect of convolving with two Gaussian functions of different widths is most easily found by converting to the Fourier domain, in which convolution becomes multiplication i.e. the process of creating the difference of Gaussian pyramid is shown in Figure 1.

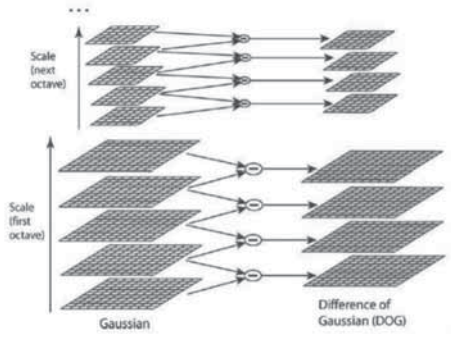


Figure 1: Process of creating the difference of Gaussian pyramid

In the figure 1, image pyramid is composed of O (octave) group and each O group is S (sub-level) level. When the image Gaussian pyramid is created, the parameters, s (coordinate of scale domain),O,S must be evaluated, and their relation is defined as follows:

$$\sigma(o, s) = \sigma_0 2^{o+s/S},$$
$$o \in o_{\min} + [0, \ldots, O-1], \quad s \in [0, \ldots, S-1] \qquad (4)$$

where s_0 is an initial width. The first group index is equal to 0 or -1. When the first group index is equal to -1, the image is enlarged double before the Gaussian scale is computed. The spatial coordinate, X, is function of octave group. So we get:

$$x = 2^o x_0, \quad o \in Z, x_0 \in [0, \ldots, N_0 - 1] \times [0 \ldots, M_0 - 1] \qquad (5)$$

If $[M_0, N_0]$ is the resolution of the basic group, o = 0, so we can get resolution of other group:

$$N_0 = \left[\frac{N_0}{2}\right], M_0 = \left[\frac{M_0}{2}\right] \qquad (6)$$

In the article of Lowe,

$$\sigma_n = 0.5, \sigma_0 = 1.6 \cdot 2^{1/S}, o_{\min} = -1, S = 3$$

CREATING SIFT FEATURE VECTORS

Keypoint detection

This stage is to find the extrema points in the DOG pyramid. To detect the local maxima and minima of D(x, y, σ), each point is compared with the pixels of all its 26 neighbors (Figure 2). If this value is the minimum or maximum this point is an extrema. We then improve the localization of the keypoint to sub pixel accuracy, by using a second order Taylor series expansion. This gives the true extrema location as:

$$z = -\left(\frac{\partial^2 D}{\partial x^2}\right)^{-1} \frac{\partial D}{\partial x} \qquad (7)$$

where D and its derivatives are evaluated at the sample point and x=(x , y , σ)T is the offset from the sample point.

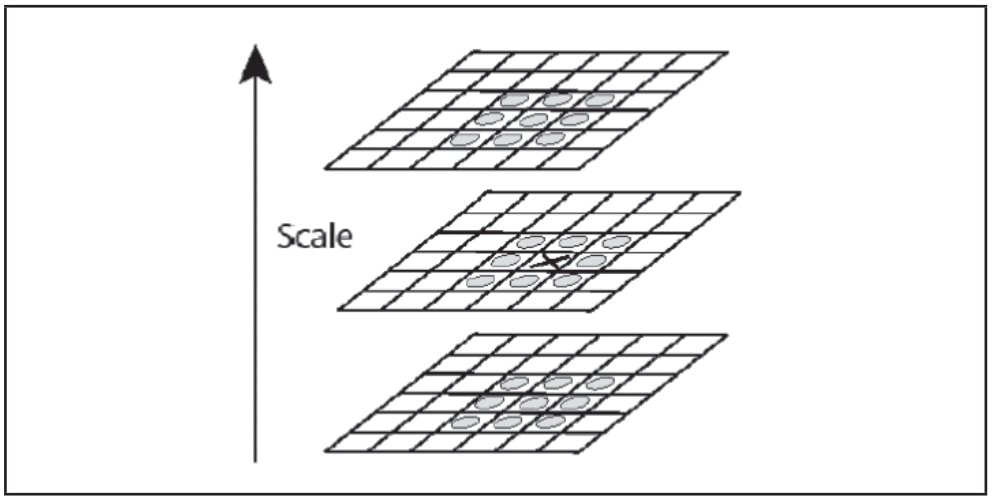


Figure 2: An extrema is defined as any value in the DoG greater than all its neighbors in scale-space

Key-point elimination

This stage attempts to eliminate some points from the candidate list of keypoints by finding those that have low contrast or are poorly localized on an edge [8]. The value of the keypoint in the DoG pyramid at the extrema is given by:

$$D(z) = D + \frac{1}{2}\frac{\partial D^{-1}}{\partial x} z \qquad (8)$$

If the function value at z is below a threshold value this point is excluded. To eliminate poorly localized extrema we use the fact that in these cases there is a large principle curvature across the edge but a small curvature in the perpendicular direction in the difference of Gaussian function. A 2x2 Hessian matrix, H, computed at the location and scale of the keypoint is used to find the curvature. With these formulas, the ratio of principal curvature can be checked efficiently.

$$\frac{Tr(H)^2}{Det(H)} = \frac{(\alpha+\beta)^2}{\alpha\beta} = \frac{(r\beta+\beta)}{r\beta^2} = \frac{(r+1)^2}{r} \qquad (9)$$

So if inequality (9) fails, the keypoint is removed from the candidate list.

Orientation assignment

This step aims to assign a consistent orientation to the keypoint based on local image properties. An orientation histogram is formed from the gradient orientations of sample points within a region around the keypoint. The orientation histogram has 36 bins covering the 360 degree range of orientations. The gradient magnitude, m(x, y), and orientation, θ(x, y) is pre-computed using pixel differences:

$$\begin{aligned} m(x,y) &= \sqrt{(L(x+1,y)-L(x-1,y))^2 + (L(x,y+1)-L(x,y-1))^2} \\ \theta(x,y) &= a\tan 2\left(\frac{L(x,y+1)-L(x,y-1)}{L(x+1,y)-L(x-1,y)}\right) \end{aligned} \qquad (10)$$

Peaks in the orientation histogram correspond to dominant directions of local gradients. We locate the highest peak in the histogram and use this peak and any other local peak within 80% of the height of this peak to create a keypoint with that orientation.

This computes the location, orientation and scale of SIFT features that have been found in the tire impressions image (figure 3). These features respond strongly to the corners and intensity gradients.

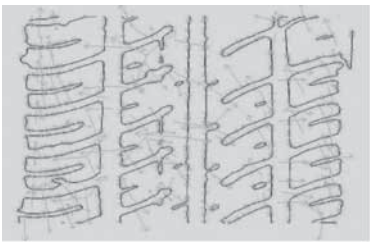


Figure 3: The messages of keypoint in the tire impression image

Descriptor computation

In this stage, in order to achieve orientation invariance, the coordinates of the descriptor and the gradient orientations are rotated relative to the keypoint orientation. In our implementation, the16*l6 pixel neighborhood regions are sampled around the keypoint location. The neighborhood regions are homogeneous classified into 16 sub regions which are 4*4 pixels. Then the gradient histograms of 8 orientations are computed in the each 4*4 pixel region. So a SIFT descriptor contains 16x8=128 elements in total (figure 4).

$$S = \left\{ \begin{matrix} s_{01}, s_{02}, \cdots, s_{08}, s_{11}, s_{12}, \cdots, \\ s_{18}, \cdots s_{f1}, \cdots s_{f8} \end{matrix} \right\} \quad (11)$$

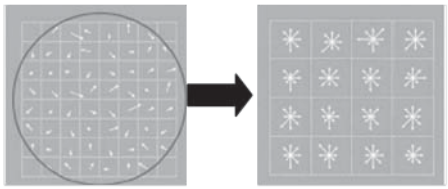


Image gradient *Keypoint descriptor*

Figure 4: Left: the gradient magnitude and orientation at a sample point in a square region around the keypoint location. Right: The image gradients are added to an orientation histogram. Each histogram include 8 directions indicated by the arrows and is computed from 4x4 sub-regions. The length of each arrow corresponds to the sum of the gradient magnitudes near that direction within the regi+on.

Tire impressions image matching algorithm

For the tire impressions image matching, descriptor vectors of all keypoints are stored in a database, and matches between keypoints are found based on Euclidean distance. The suggested method of matching to large database is the nearest neighbor algorithm combined with comparing the distance to the second-nearest neighbor, specific standards are as following:

$R_1 < R_0 * k$, the two keypoint are successfully matched, kE (0,1).

ANALYSIS OF EXPERIMENT RESULTS

In this section, the purpose of experiments is to verify the feasibilities and robustness of the proposed method for tire impressions. The tire impressions images used in this work and the results of tire impressions matching with the proposed SIFT-based algorithm are presented.

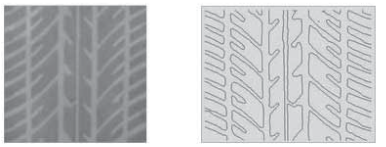
In our implement, tire impressions image imprinted from tread pattern of the tires from different cars are used. 40 tire impressions images of size 491×391 have been selected in this work. For testing the robustness of the proposed method, the images are rotated into various angles and changed different intensities of illumination etc. 120 images have been used in this work.

Steps of calculation

1) The edge of tire impressions extracted with C-V model;
2) The SIFT characteristics vectors of tire impressions computation, including: keypoint detection, keypoints elimination, orientation assignment and descriptor computation;
3) Tire impressions matched based on Euclidean distance;

Pre-processing of tire impressions image

Before tire impressions are matched and features extracted based on SIFT, the edges of the tire impressions images are conducted with C-V model without Re-initialization (fig. 5).



Tire imprint image *Edges of tire impression*

Figure 5: Left: the tire tread pattern image is imprinted from a tire of a vehicle. Right: the edge of the tire impression is extracted with algorithm based on C-V model without re-initiation

The results of a tire impressions image and the edge of tire impressions with SIFT-based algorithm are shown in the figure 6 and table 1.

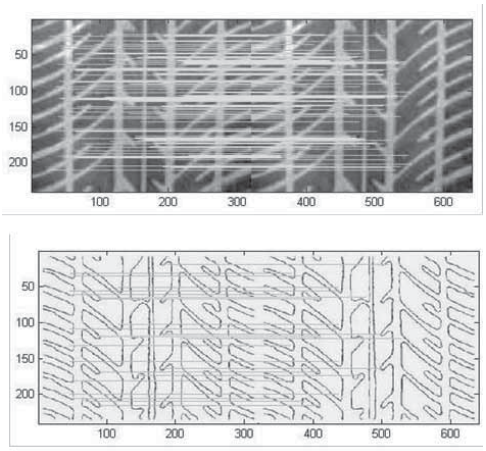


Figure 6: The matched results of a tire impression image based on the SIFT: top: original image of a tire impression; below: segmented image of a tire impressions edge

Table 1: The matched points pair and cost time

	Matched points	Time/s
Original image	263	0.236
Segmented image	65	0.068

From the matched results of a tire impression, the matched point pairs are dynamic decreased from 263 to 65 while the cost time of the original image is less triple than that of the segmented image. So in the later experiment, the tire impressions images must be firstly segmented with C-V model without Re-initialization so that the edge is extracted from original tire impressions image.

Selection of parameters

In the process of matching algorithm based on SIFT operation, the parameters of threshold, T_N, and the corresponding point pairs, PM, must be evaluated. In our implement, threshold, T_N=0.6, 0.7, 0.8, the relationship of the recognition rate of tire impression and the matching point pairs is shown in figure 7.

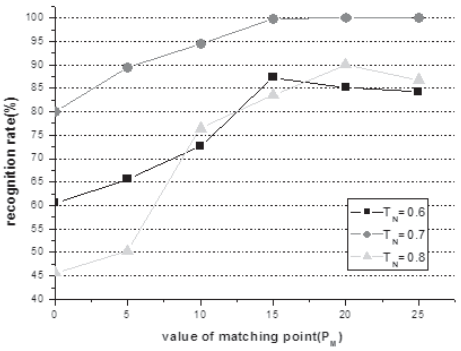


Figure 7: The relationship among matching accuracies, threshold and matched point

From the result of the experiment, when threshold, TN, is equal to 0.7, the recognition rate is more than others. So threshold, T_N=0.7 in the following experiment. The relationship of matching points and matching accuracy is shown in table 2. When the value of matched points is 15, FAR=0.2% and FRR=3.56%. So the matched point pair is equal to 15. Namely the two tire impressions are successfully matched if the matched points are more than 15.

Table 2: The relationship between matching accuracies and matched points

Matched points	0	5	10	15	20	25
FAR	20%	10.5 %	5.6%	0.2%	0.03 %	0%
FRR	0.56 %	2.26 %	2.89 %	3.56 %	8.6%	18.8 %

Experiment results and discussion

The feasibilities and robustness of the proposed method for tire impressions images are shown in figure 8. In this figure, it is found that percentage of correct recognition is maintained for the changed and normal tire impressions. The SIFT features have been shown to be invariant to the image rotation and scale and robust across a substantial range of affine distortion, addition of noise, and change in illumination. But for normal tire impressions, the proposed algorithm is working better than that for the changed: for the normal tire impressions, the recognition rate is approximately equal to 100% at rank=10 while that at rank=16 for the changed tire impressions.

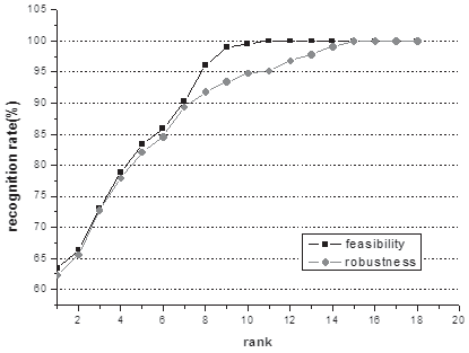


Figure 8: The CMC curve of the tire impression image

CONCLUSION

The SIFT-based matching algorithm has been created and tested for the tire impressions image recognition. The results show that the SIFT feature retains the important characteristics of the rotation, scaling, brightness variation tire impression image; the matched accuracies are high for the tire impressions recognition.

REFERENCE

1. LUO Min, ZHU Xiaomin, LI Xiaohong, etc. Wavelet-Radial Descriptor Based Algorithm for Image Feature Extraction [J]. Geomatics and Information Science of Wuhan University, 2008.01:29-31
2. Tuceryan M, Jain A K. Texture Analysis, Handbook Pattern Recognition and Computer Vision [M]. Singapore: World Scientific, 1993:235-276
3. K. Mikolajczyk, C. Schmin. Indexing based on scale invariant interest Point [J]. ICCV, 2001:525-53
4. D.G. Lowe. Object recognition from local scale-invariant points [J]. IJCV, 1999:682-688
5. D.G. Lowe. Local feature view clustering for 3D object recognition [C] IEEE Conference on Computer Vision and Pattern Recognition, 2001:l-7
6. D.G.Lowe. Distinctive image features from scale-invariant keypoint [J]. Inter-national Journal of Computer Vision, 2004, 60(2):91-110
7. WITKIN A P. Scale-space filtering[C]//Proc. 7th International Joint Conference on Artificial Intelligence. [S. l]: IJ-CAI, 1993:1019-1022.
8. Lowe, D.G. 2004 Distinctive Image Features from Scale-Invariant Keypoints. January 5, 2004

TOPIC VI

CONTEMPORARY SECURITY STUDIES AND SECURITY OF THE REPUBLIC OF SERBIA

UDC: 316.42
351.862/.863

THE STRATEGY OF SOCIAL DEVELOPMENT AND THE MORAL UNITY OF A PEOPLE AS THE BASES OF SECURITY[1]

- On the Relevance of Reiss's Ideas on Justice, Concord and Patriotism of the Serbian Nation -

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Abstract: We live in an age of hyper-technological progress and social sub-development of humanity. The most prominent minds indicate that the actual sources of the modern crisis lay in the spirit of selfishness/greed, that is, the deficit of social solidarity, since as Edgar Morin states "the modern crisis stems from the fact that humanity is not humane enough." This diagnosis indicates the need to search for the deeper structural causes of its generation and its possible implications on the moral unity of a people and security of a country.

This paper focuses on the problematization of the thesis regarding the relationship between the development strategy and the actors, social inequality and moral unity of a people and their influence on the security of a society. The author supports the attitude that the choice and realization of a strategy of social development has a defining effect on the structure and dynamic of a society, the character of social relations, stability, security and the perspective of a people.

In his deliberations, the author analyzes the implications of the neoliberal strategy of social development for the relations between social groups/social stratification, moral and social cohesion or the processes of disintegration and thus the security of a country. In this context the author reactualizes the significance of Reiss's messages on the patriotism of the Serbian people, and the relationship between the elite/intelligence and the people and the significance of social justice, unity and moral unity for the geopolitical survival of the Serbian people.

Key words: development strategy, security strategy, patriotism, moral unity, Reiss's messages

"Serbs, hear me out,
beware of yourselves,
your destiny is in your own hands –
it could be both a shining future
or renewed slavery!
Despite everything,
I believe
in the future of your nation

*(*Dr. Rudolph Archibald Reiss, *Serbs hear me now)*

INTRODUCTION: THE PERMANENT AND CURRENT NATURE OF THE MESSAGE OF ARCHIBALD REISS IN HIS WORK *SERBS, HEAR ME NOW*

In the crucial epochs, whether there was a war raging or any Copernican developmental-civilizational changes (revolutionary twists/social and moral cataclysms), what is at stake is an organic or forceful quickening of the course of history. In these star-struck or dark days for humanity, days

1 This paper is the result of the author's research on the macro-project "Tradition, modernization and national identity in Serbia and the Balkans in the process of EU integrations" (179074), which is being realized by the Center for sociological studies at the Faculty of Philosophy of Niš and financed by the Ministry of Education and Science of the Republic of Serbia.

which have "impressed the world", as John Reed wrote, as if on the grid of time/history – what is best recognized are long-term and true values – people and peoples, their characters (virtues and weaknesses).

In one such fateful for the Serbian people time of trouble, the First Great War of the 20th century, *Archibald Reiss*, a reputable criminologist with a world-wide reputation, had the honour to live, in the midst of war and heroic struggle, with Serbian warriors and patriots, meet the Serbian people up close/from the inside, to understand the Promethean-Titan epic heroic greatness of his warrior-patriots, their hospitality and the noble soul of the Serbian people, but also the shiftiness of politicians/politicants, the oriental primitivism of bureaucracy, opportunism and the moral downfall of intelligence/the national pseudo-elite.

At the very end of his life, as a posthumous legacy for the Serbian people, *Archibald Reiss* left his manuscript entitled *Serbs, hear me now*! In it, among other things, we find the following: "I was with you when you were in dire need. I shared with you your suffering and in order to do so, I sacrificed a wonderful life and a budding career which was very promising. I fell in love with you, since I saw with my own eyes your people in battles and decisive moments, when the true character of a nation can be seen. I fell in love with you for the sacrifices I made for you, as we become attached to people and things all the more if that attachment requires a sacrifice" (Reiss, 2006: 7).

Critically dissecting, in his analysis, almost all the social layers of post-war Serbian society and indicating the weaknesses/flaws and virtues of the Serbian people, he ends his legacy *Serbs, hear me now!* with a message, of a still current and lasting importance:

"In spite of everything, I believe in the future of your people. The spirit of Kosovo, Karađorđe, Kumanovo and Kajmakčalan will reawaken. It must, however, awaken soon, since without it you may once again experience a time of servitude which will by no means lag behind the ones you have already suffered, which your ancestors have defeated with sacrifice and heroism. *Your destiny is in your hands: a shining future or renewed slavery*! (Ibid, 108).

THE SOCIOLOGICAL TRUTH OF THE LEGAL-POLITICAL SYSTEM LIES IN THE SELECTION OF THE STRATEGY OF SOCIAL DEVELOPMENT AND THE CHARACTER OF THE PRODUCTIVE RELATIONSHIP OF THE SOCIETY

No matter what kind of ideological and political rhetoric a social order might take on, its true face, its "soul" uncovers a global strategy of social development and the character of the ruling productive relationships. The *normative paradigm* of an order (legal-political and even security order) most often represents a projection for the institutional structure of a power order, the regulation of the relationship between a state and a civil society, those who rule and those being governed (the citizens), the parts and the whole.

Starting from the *functionalist paradigm*, which in modern science on management is used for the projection and development of institutional systems – work organization, management and security, we might say that: the organizations/systems represent different kinds of government groups (more/less hierarchically constituted) which enable regulated flow/traffic between individuals/social actors in the system, for the satisfaction of certain needs, the realization of group/social aims, which enable the reproduction of certain forms of social life and systematic integration.

An entire cosmos of legal norms (starting from the Constitution, then system laws, regulations, to the lowest legal acts) and the *institution order* based on them has as its aim to make norms of/control/regulate or self-regulate the function of various actors in the social space. Many of these institutions, which function to help the maintenance, self-reproduction of the order, can have/do have their own manifestation and latent function, declared and invisible/actual in the social life/development. The former serve for the legitimization and "mesmerizing" of the subjects/citizens, their ideological-cultural socialization, homogenization, integration into the given ruling order, while the

latter reveal the true nature of the "invisible society", the real structures of power, how this power is generated and how it "lives" shaping the actual character of the social relationships.

From Machiavelli to Montesquieu, to Marx, the *legal-political and social sciences* have uncovered the essence of the systematic regulations in society – indicating the real role of interest, "the spirit of the law", the separation of the government in the founding/functioning of democracy, as well as the significance of the character of the productive relationship for the understanding not only of the distribution of social power, but also dialectics of history, the transformation of the political, social systems. It has become quite clear that the systems/governing groups are constituted around the dominant interests of the social groups, and that the call for certain symbolic values often represents an ideological rationalization of the governing system. In a word, the legal-political systems, ultimately, express the power of the economically most powerful groups in society or, in other words, those who in their institutions/mechanisms of power enable – the governing groups control/manage the movement of extra labour.

The *civil revolution* (1789) undeniably carried universal values into the dialectics of human history. Its ultimate goals have been expressed in the slogan: *freedom, equality, brotherhood*. The fight to "finish"/realize their essence – even after 200 years, is still going on. Two great movements: the liberals and socialists – have competed over it for the last two centuries; and, while the liberals have forced the problem of attaining freedom/democracy, socialists – with more or less success/failure insisted on the problem of social equality. The implosion of socialism/communism (1989) meant the fall/suppression from the political scene of both actors and the return of the neoconservatives. During the past thirty years in the world, a constellation of power is at work – one which follows the strategy of the *ideology of neoliberalism*. The *neoconservatives* today are realizing a program of historic restoration under the conditions of world globalization. The main actor in this project is the so-called "black aristocracy" that is, the financial bourgeoisie – which as a hyper-class is in the service of the mega capital, controls the flows of world capital. It instrumentalizes the speech on democracy and the universalization of human rights and freedoms/of "democracy without borders", for the purpose of extending financial markets into new fields, imposing on the world the Anglo-Saxon neo-colonial model of development, as the only one/as having no alternative.

The *new masters of the world* have placed under their control numerous international institutions (MMF, the World Bank, the World Trade Organization, NATO), and through their lobbies they control/focus the work of other institutions (The Security Council, the Hague Tribunal, the global media). In the constellation of their interest today the *new world order* is now being built in the function of the world financial oligarchy, the villainous international organization. Based on the measure of its interest what is built today are the rules of the game as a part of that order/"the new world disorder". But, since there is some truth in Huxley's though that: "the absolutization of each passion, sooner or later leads to nothingness", it happened that it was precisely as a part of the strategy of neoliberal development/anarchistic globalization and asymmetric globalism – that the *modern economic/social crisis* was born in the world. Namely, the *actors of the neoliberal strategy* by preferring the financial sector, the expense of the sector of real economy, and their interest above the interest of the other layers of society and parts of the international community, have led to a depression/recession and paved the way for a deep economic and social crisis in the modern world. What it has as its consequence today are numerous financial and political "quakes". The measures which the ruling elite today use to subdue it are palliative and short-term. They mitigate the consequences and do not remove the structural generators. It is important to point out that this crisis is structural, systematic and is a "second wave". It is spreading into all spheres of society and will lead, in the middle of the 21st century, to essential changes in the system of capitalism. Its alternative is certainly some sort of post-capitalist society or a new technocratic totalitarianism/fascism. Such are, for now, the prognoses of critical sociologists from Europe and the USA (Bourdieu, Wallerstein).

By viewing the global world system and in that context the so-called countries in transition, we might be able to make up the *typology of global systems*/societies. Starting from the world-system paradigm of *Wallerstein*, all societies/countries can be classified, on the basis of their position in the world distribution of labour, into: a) societies in the world centre; b) societies partially on the outskirts, c) societies at the very outskirts. If we were, however, to start from the relationship of the

society towards innovations/development, a classification could be made into: a) innovative societies; b) imitative; and c) blocked.

In the sociological analysis of the strategies of development in post-socialist countries in transition, we have made up a special typology.

Table 1. The type of transition, strategy and society (the typology of post-socialist societies based on the social direction of the transition process)

Transition type	**Strategy model** (with a key concept)	**Type of society**
1. Inversive, regressive pre-modern	Re-traditionalization (ethno-feudalism, tribal society)	traditional, pre-urban, proto-modern
2. Reversible and neoliberal	Dependent modernization (neoliberalism)	capitalist, peripheral, dependent
3. Reversible neoconservative	deformed real-socialist authoritarian modernization (neo-etatism)	Semi-peripheral Politocratic society
4. Progressive social-democratic (a transition with social responsibility)	Social-democratic modernization (social partnership, «welfare state»)	modern, developed, pluralist, social-democratic society

Source: Lj. Mitrović, *Savremeno društvo: strategije razvoja i akteri*, IPS, Beograd, 1996: 167.

The thesis that we aim to prove is that the selected strategy will have a deciding factor on the formation of the historic type of society (on the division of social power, social structure, social character), and thus the shaping of other subsystems of society, including the legal and security system.

THE CHARACTER OF THE SOCIAL SYSTEM AND THE PLACE AND ROLE OF THE SUBSYSTEM OF SECURITY

Society represents a complex organism of associations of partial and global groups/activities, institutions, actors. *Security systems* are subsystems of a global social system of society. Since Plato all the way to the modern functionalists it has been considered that harmony and justice in society can be realized if each part (subsystem, stratum, institution) plays its own role, serves to preserve and maintain the social whole. In the centre of their analysis we find a system and not a man. These kinds of holistic theories are often used to legitimize totalitarian regimes, since the non-dialectic ones treat/separate the relationship between a personality and a system. Contrary to that, the representatives of individual particularism – prefer individuals and their freedom, and neglect factors of integration in society. An example of that is the neoliberal individualism of K. Popper – whose protagonists in modern science atomistically observe society, as a kind of social-Darwinian mechanical aggregate in which the Hobbs/Darwin principle of "waging war against everyone" is still dominant. In this context of deliberation we could say that *modern society*, of post-national constellations and postmodern culture is an example of a highly individualized society of egotistic individuals and groups with decreased social solidarity. In a word, we live in a global age of hyper-technological development and social sub-development (as M. Castells wrote in his study *Network society*). Such a society is highly technologically developed, internationalized/globalized, but on the inside divided and not marked by solidarity. It is referred to the phenomenon of social Darwinist *Globalistan*; fragmented/divided in a social, class and cultural-civilizational sense. That is why there are researchers who today write on the topic of the phenomenon of technological globalization and social-cultural re-tribalization/balkanization of the world.

Starting from the social character of the global society and the location/role of the *model of the security system* in it, all of the models could be classified into a: a) democratic-participational; b) etatistic-authoritarian; and, c) corporative-technocratic model. In addition, a division is possible for security systems, based on the level of generality and their functions, into: a) local; b) national; c) regional; d) international, and e) globalistic.

The democratic-participational model of security could be found in social-democratic solidarity societies. Within them the system of security is based on mass self-protection, that is, the responsibility of all of the citizens for the security level, and not only certain state institutions/organs and professionals. In these societies there are mechanisms of participative control – institutions – from the bottom up, from within and on the part of the actors of the civil society/public. In this horizontal, grid-like, and participative system of security, citizens are, in addition to state institutions, active subjects in the security system.

The authoritarian-etatistic model of security resides on the principle that security is vertically/hierarchically structured and solely a matter of state organizations, professionals as keepers of the system (the military, police, and judicial system).

The corporative-technocratic system of security is in the service of international strengths of corporatocracy and globalism.

However, the best one is the mixed system of security in a modern day and age which combines mass, democracy and professionalism in the realization of security in society.

MARGINALIA ON THE CORRELATION BETWEEN THE GROWTH OF SOCIAL INEQUALITY AND THE REPRODUCTION OF CRIME, OF THE RELATIONSHIP BETWEEN JUSTICE AND LAW IN A GLOBALIZED WORLD

Modern sociological and criminological research (especially that of French sociologists) leads us more and more to the conclusion of the existence of a high degree of correlation between the index of social inequality and the growth index of the occurrence of crime in the modern society. This points to the need for deeper structural changes in society (changes in the strategy of development, the reduction in social inequality, the strengthening of the employment rate and the quality of life of segregated marginalized groups), as the true essential preventive measures of criminality, and not only of dealing with the consequences and the question of the effectiveness of the legal, security system and repressive measures.

It is a well-known fact that people are not born as criminals, racists or terrorists, but become so in a certain socio-cultural context. Crime and terrorism are primarily social occurrences, structurally determined through the grouping/character of the internal and international relationships by a system of inequality/power. Under the conditions of an asymmetric model of globalization, a neoliberal model of development and neo-imperial re-colonization of the world, the reproduction of crime and violence has been internationalized and increases ever more. Namely what is at stake here are the processes of the interconnection of the mafia, terrorist groups, with the use of new technology and methods of work. In the case of the Balkans, we might say that the mafia has more intensively connected in this space when compared to the processes of economic and political connection and cooperation. Still, we should point out to the fact that that crime is generated as a side-effect in the transactions between transnational corporations and national companies. What is at stake are processes of the connection of interest between the hyper-class of the TNC/mega capital and national comprador bourgeoisies in the exploitation of the natural wealth/resources and work force, for the purpose of extracting extra profit from countries in transition.

We should mention here that the numerous forms of modern crime in societies in transition have been induced from external factors, in transactions with the TNC. In that sense, the managerial elite in Serbia is also not innocent, nor is the elite in the USA and EU (take for example the privatization of *Sartid* and other companies in Serbia).

If in the modern world the neoliberal strategy of the market fundamentalism is at work, in which all of the values have been reduced to profitability and which have subjected man/humanity to that top goal/benefit, that is, the new hierarchy of values, then it is quite clear that the relationships on the market, and in international law and politics – are becoming more and more social Darwinist and predatory. This has led to the division between the law and justice in Anglo-Saxon law. The victory of pragmatism is at work and Machiavellianism in law and politics. Law has becoming more and more calculating, an integral part of the exchange system, and not as an integral part of social justice (the instrument of social correction, the prevention of crime and deviant personalities). When the law is separated from social justice, it becomes an instrument of violence.

Modern analyses indicate that the USA, which was at one time a prime example of the democratic world, is today a country with the greatest number of prisons/prisoners. All this testifies, implicitly, to the degree of socially structured violence in American society, which generates and reproduces certain types of criminality and violence.

What would be interesting are the simultaneous comparisons in the modern world between the characters of social relations (the index of social inequality), the index of criminality and degree of development of the legal system. Sadly, such serious analyses are not readily available. They are being replaced by various "measuring" of analysts and agencies in the world, whose work is most often instrumentalized for the needs of various lobby groups and international institutions and transnational corporations.

In the modern world of the globalized "*new world order*", a tendency for the separation of law and justice is visible, as is the instrumentalization of law for the strengthening of domination of the power of great capital and its neo-imperial expansion. The influence of the Anglo-Saxon model, pragmatic, selective calculating law, is increasing in the world. In the USA, as the embodiment of the "brave new world" in its own concept of law, just like in Orwell's world, *all citizens are equal, only some* (American citizens, troops and their TNC) *are more equal than others*. Of course, such an understanding of law and justice, with double standards, certainly has an influence on the international relationships in the world: the resurrection of force/violence; "the diplomacy of cannon fodder", of "the carrot on a stick". We are faced with the introduction, with the aim of modernization of the legal system, of new institutions (from the "protected witness" to judicial indulgences), all the way to the attempts to legalize state terrorism under the guise of human rights and the "export of democracy"; the division of states into stable/functional and weak/non-functional in the global world system. On this basis today attempts are being made to legitimize the concept of "liberal democracy" and the re-evaluation of the modernization/missionary role of colonial forces in the past.

Bearing in mind such occurrences and tendencies in the modern world, it might seem necessary to us to point out that, simultaneously with the modernization of the legal system in the country, it is necessary to critically subject both the global concept of development, which today is characterized by the noncritical idolatry of neoliberal lack of alternatives, and the work practice of international institutions of law and justice.

The *culture of addiction,* which today uses various mechanisms to expand outward from countries at the centre of the world (Big Brother), is characterized by a noncritical adherence to patterns, procedures from the west, as *a priori* unquestioned values and effective institutions. In this context, the local justice system, in the name of modernization and Europeanization, subjects itself to the logic of "westernization" and the "macdonaldization of society". It is up to our local judicial institutions and professionals which work within it, just to be successful, technically effective hunters in the "mousetrap" or "golden cage", which has been tailored to suit the Big Brother. This understanding of one's own mission of the local actors is primarily in the spirit of a dependent/imitative modernization. For that reason, the reform of our justice system has reduced itself to technological modernization of procedures and architectural expansions and "aesthetics" of investigative and incarceration facilities, that is the forms of instrumental rationalization (the new legal and technical procedures, new more functional buildings/forts) and not resigned itself to the improvement of the spirit of the law and its preventive or social-educational implementation.

SOCIAL SOLIDARITY AND THE MORAL UNITY OF A PEOPLE – AS THE BASIS OF SECURITY, REDUCTION AND ELIMINATION OF CRIME

It is certain that the production of social relations in a country/the world depends on the selected and implemented strategy of development. In that context, it is important to emphasize that the strategy of the development in social practice always implies/generates social equality or inequality, and this further produces/expands or decreases the space for various occurrences of crime; it creates or destroys the basis for social cohesion or fragmentation of moral/political unity, that is, it strengthens or destabilizes the security of a social system of global society. In solidarity societies, with social-democratic models of development, the harmony between social layers is greater, and thus the degree of the unity of the citizens around a general national or social interest.

In societies with relatively greater social equality/equality of social opportunities for social groups, based on the rule – the smaller the crime rate, the greater the responsibility towards the public/general interest and the higher the degree of participation of citizens in the building of a system of self-control, self-protection and security.

A culture of security/a culture of self-protection are directly related to the degree of the realization of social justice in society, the harmony between personal and general interests, that is, the motivation of the citizens to defend the common good. Only systems which successfully bind the struggle for/creation of human freedoms/political rights with the realization of their social rights/the right to work and suitable compensation, with the fight to protect the moral and physical integrity of employees (dignity, control and "humanizing" the extent of the exploitation of other people's work) are "decent", healthy and responsible societies. Otherwise, *hypocritical* societies are at work– which by spreading poverty and repression – strengthen the culture of violence/fear and destroy the "constitutional patriotism" of the citizens of a country.

Bearing in mind both historic experience and also the development of scientific knowledge and modernity, we can conclude that the question of a stable and maintainable peace is closely bound to the degree of the realization of social justice in the modern world, and this presupposes the abandonment today of the governing/neoliberal strategy of social development and its radical replacement by the social-democratic concept, which would enable every society/country in the world to form a partnership of all its social layers and develop peace. Only such a *society – of equal social opportunities* – will enable the creation of great slogans for the incomplete civil revolution, which have a permanent and universal significance (*freedom, equality, brotherhood*).

It is becoming quite clear that the *modern crisis* has been conditioned by the current global model of social development which has unquestioningly been realized for 30 years. And this crisis has, among other things, been caused by the fact, as *Edgar Morin* states – *that humanity is not humane enough*! For that reason the genuine recovery of the modern world is not possible without a new choice of the strategy of development, which will make all the classes, social layers, social groups, nations and citizens responsible for the development of peace and prosperity in the world. In that sense, Silvio Lula was right in saying: *without global justice there is no global peace in the world*. This means – that only in the unity of the character of social relations, in the perspective of strengthening the processes of social equality and solidarity, can we expect the strengthening of the moral density of the population, that is, moral patriotic upbringing as a part of the collective consciousness, which forms the real basis for not only "mechanical" but also "organic solidarity" (*E. Durkehim*), that is, the true unity of the population/citizens and the realization of their *constitutional patriotism* (*J. Habermas*), without which there is no safe system, peace or stable development of a society.

REFERENCES

[1]. Rudolf Arčibald Rajs, *Čujte Srbi, čuvajte se sebe*, „Logos", Beograd, 2006.
[2]. K. Rener, *Socijalna funkcija pravnih institucija*, PLATO, Beograd, 2007.
[3]. Lj. Mitrović, *Tranzicija u periferni kapitalizam*, IPS, Beograd, 2009.

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THEORETICAL-METHODOLOGICAL FRAME OF RESEARCH OF NATIONAL SECURITY[1]

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„The highest task for a human being is to know and understand objective world and its laws."
Spinoza

Abstract: A notion „security" itself is a very complex and comprehensive social phenomenon. Throughout history this notion has encompassed various contents. The interpretation of security as a true human value, need and interest leads to understanding of freedom as the highest ideal and universal determinant of modern development of humankind. The freedom, having been comprehended in this way since the time of antic Greece, implies a political right of citizens to bring decisions regarding all issues of public interest, including the issues in the field of security. The paper analitically and gradually interpret methodology of writing of scientific-research work – making of scientific-research projects in the field of national security. The paper defines science and its legality as well as methodology and general notions that are inavoidable in the use when it comes to writing scientific papers in the field of national security. For purpose of understanding writing of scientific papers in corect methodological way the paper elaborates further issues: selection and definition of the problem of research; definition of notions and notional analysis; determination of objectives of research; making hypothesis; identification and classification of variables; operationalization of variables; determination of the framework of research; basic methods of scientific thinking and research in social and security sciences; practical research work (field-work), arrangement and data processing; interpretation of the data and writing of scientific report.

Keywords: national security, scientific work, methodology, method, research, indicators, variables, hypothesis

Security science was established a couple of decades ago, following demands of modern international security reality. A huge number of factors influenced the establishment and definition of this scientific discipline and among them some most significant ones are: a growing number of increasingly destructive forms of imperilment of security that needs to be analysed at the highest scientific level; dynamics and comprehensiveness of a growing number of social relations, natural and technical events that are in a causal-consequental relation with problems of security of citizens, state and international community; attained level of knowledge and information regarding sources and forms of imperilment of social security as well as a need for establishment of efficient system of integral security.[2] Security as the scientific discipline is based on certain preconditions that are starting points in a scientific analysis and final determination of its structure. If integral security demands the scientific analysis for purpose of discovery of principles and legality, then the field of security as a part of the sicence in establishment of a scientific system starts from the point of certain principles (preconditions) such as: an analysis of political-legal system of a certain state, because national security implies protection of the state system and security by specialized institutions of the state; analysis of international relations and the place of a certain state in international community within the framework of integral and regional security in a narrow sense; interpretation of confrontation with the phenomenon of imperilment (both internal and external) in international and domestic circumstances as a category which should contribute to higher theoretical generalization;

1 This paper is a part of a project No. 179009 that is financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

2 On interdisciplinarity and multidisciplinarity of this scientific discipline see **Radoslav Gaćinović**, „Bezbednost kao moderna naučna disciplina", Scientific Paper Proceedings *SRBIJA – bezbednosni i instiitucionalni izazovi*, Institut za političke studije, Beograd, 2009, p. 17

establishment of a scientific system as a theoretical basis in preservation of security and protection of legitimate and legal order by specialized state bodies and as an expression of concrete needs of citizens to organize protective forces of society, as well as the scientific system which should also have traits of pedagogy and which, by elaboration of its own notions and categories, should provide for a gradual introduction of basic problems that it itself deals with.

In modern technology[3] of scientific researching work there has been defined some legality that is necessary for successful writing of science paper in the field of security and in the field of national security. That is a process in which some facts are scientifically analyzed and there are also presented some other methods of research, along with a critical approach toward the topic which is an object of research. This implies that the author of the paper needs to find answers which have not been known before and that the author ought to make questions which have not been made before. This is why the process of acquirement of knowledge is not called "learning" but "studying". *While learning is based on memorizing, studying is based on thinking*. Thinking is not the same as scientific thinking. The scientific thinking is only one specific way of thinking and its objective is to be a true (truthful) thinking (the truth – Gr. *aletheia*; Lat. *veritas*). When researchers deal with methods, the word for that is methodology. Object of research of methodology are scientific methods and the object of research of scientific methods is a part of objective reality which some science has defined as its object. Totality of methodological procedures applied by a particular science or a group of related sciences in order to acquire new knowledge is called methodology. Hence, all development and transformation, material and spiritual process as well as the process of establishment of security have been achieved primarily thanks to science, scientific achievements and research, and without an advanced science there could not be progress or well-being of one state and nation in the true sense of the word. Inter-dependence of the development of science and the state and people who live in it was noted in 16th century by Francis Bacon who claimed that science and human power go along hand in hand, that they intertwine and inter-relate and mutually affect each other. Bacon admired a great transformation in lives of civilized nations that had been achieved thanks to multiple and diverse implementation of various sciences. His French contemporary counterpart Michel de Montaigne claimed that „science is a very great ornament" and „a suprisingly helpful tool". If the people talked like this regarding science and its power in the 16th century, then the beginning of 21st century would be a real challenge for researchers and scientific institutions alike who have provided for accomplishment of a new rennesaince of security of the humankind.

In order for somebody to become qualified to write a science paper in the field of national security, she/he ought to fulfill these two basic preconditions: to have talent and natural disposition for it and to be versed in scientific work and its methods, developing and „nurturing" the traits that are necessary for doing this job.[4] Hence, introduction of a scientist to «the craft" of his profession is best acchieved through reading of scientific literature, but even more than that through practical work - *Fit fabricando faber* (Lat.): «One becomes a blacksmith through forging"and *Ubung macht den Meister* (Ger.): "Practice makes one a Master."

SELECTION AND DEFINITION OF PROBLEM OF RESEARCH

It is not possible to analyze security as science without prior definition of the science and notion of security. In general, science is an activity of the acquirement of knowledge on the basis of appropriate assumptions and it is also based on implementation of precise procedures for purpose of formulating logically classified and theoretically coherent statements regarding empirical reality. In its complex meaning the security implies preconditions for smooth socio-political, economic and cultural development of general civilization values that are appropriate for human beings. In addition to it, a huge number of factors have influenced continuation of scientific analysis and definition of security. Among them some most significant ones are: social and scientific need; division of work in the field of scientific research; achieved level of the knowledge and information regarding the sources and forms of imperilment of social security and a need for establishment of an efficient system of integral security; dynamics and comprehensiveness of social relations that are

3 More details in **Radoslav Gaćinović,** „Kako napisati naučno-istraživački rad iz oblasti politikologije", *Politička revija*, God. (XXI) VIII; Vol. 19, br. 1/2009, p. 275

4 For appropriate comparison see Mithat Šamić, *Kako nastaje naučno djelo*, Svjetlost, Sarajevo, 1988, p. 9

causally-consequently related with problems of internal and external security of a state; a growing number of increasingly destructive forms of imperilment of individual and collective security that needs to be analyzed on scientific level. Determination of *security* into one complex of science on the basis of classification of science is necessary for purpose of makinig a precise definition of its field, object, methods and objective and there is a theoretical, practical and pedagogical justification for it. Although security science, as it is the case with the starting level of its development, eclectically encompasses scientific knowledge on international relations, political science, history, political economy, sociology, psychology, law, certain natural sciences and philosophy along with military science, an exact definition of object of its research is a *conditio sine qua non* for its establishment as science.[5]

The problem of research in the field of national security is the most creative part of research and it has to answer the following question: "How did it happen and for what reason that the topic of research was selected as such?" – whether for purpose of relevance and attractiveness of the theme, relevant social needs, demands and practice, professional scientific interest and curiosity or due to personal reasons (the author's specific knowledges and experiences, possession of empirical data, high motivation). In case of the selection of the problem of research the following criteria have to be taken into consideration: that the designed problem is possible to research (taking into consideration a possible absence of the data, high cost of research, the data confidentiality, etc.); that the research brings into light something new and that it is not only repeating of some priorly obtained knowledge and that the research could be implemented in practice, etc. Formulation of the problem of research is expressed in the form of declarative sentence which checks a situation or relation or a question. The problem should not be too loosely defined, it should be strictly specified and concretized and there should be presented explanation as to why the research in question is necessary to conduct and what practical and theoretical solutions are to be expected of it, etc. Therefore, the problem is the scientific field within which scientific interest of the researches is located (focused). It is very important to know that practical research begins with the problem of research which is very specific. The problem of research is based on curiosity and becomes evident when there is not enough knowledge regarding it. Without the problem of research it could not be possible to conduct the research. It is not possible to conduct an important research regarding an insignificant problem. Therefore, in case of a scientific research it is important for a researcher that he/she is sensitive to problems and that the researcher is capable of selecting the most significant one among a huge number of the problems for the research.[6] When selecting the problem one needs to take into consideration a great number of criteria, in particular: a novelty – when selecting a problem one should avoid unnecessary repeatings (reruns) of the research. That is why prior to making final decision on conducting a research, one should check in advance whether such research had been already conducted before it and also what is *the significance of the research* as well as *applicability of its results* in practice. *Curiosity* and *interests* are also significant criteria when selecting a problem of research, because the curiosity encourages human spirit for the research. In addition, it is also instrumental value of knowledge that can be motivation for researchers.

One significant criterion when selecting a problem of research can also be the *expertise of a researcher* who is usually the one who chooses a problem of research. When it comes to the selection of a problem of research in the field of security it should be taken into consideration whether the researchers' team have *appropriate equipment and working conditions*. If the researchers do not have a minimum of necessary equipment and working conditions, it is necessary to give up on the research. *Sponsorship and collaboration of the centers of decision making* is also an important criterion for choosing a research problem. *Research costs* are often higher than anticipated in the beginning of the research and there is a need for conducting a thorough economic analysis and realistic research bill before the beginning of the research. When selecting a problem of research one should also take into consideration *risks, imperilments and obstacles* which might hinder implementation of the research of a certain problem. One should also have in mind when selecting a problem of research that for each research a certain amount of time is needed. *Actuality of the problem of research* is also an important criterion and it should not be allowed that one research lasts for such a long time that its results finally lose their actuality. *Possibility of solution of some problem with the help of the research*

5 Dragan Simić, *Nauka o bezbednosti*, Službeni list SRJ i Fakultet političkih nauka, Beograd, 2002, pp. 59-60

6 Radoslav Gaćinović, Izbor i definisanje problema istraživanja, *Politička revija*, god (XXIII)X, Vol. 27, br. 1/2011, pp. 54-55

can also be one of the most significant inspirations for a researcher.[7] Hence, when selecting a problem one should take into consideration all these criteria, in particular the criteria from the aspect of contraindication (side effect). In elaboration of the project of research defining of the problem of research is a separate task. The title of research is one thing and the problem of research is another one. The title of the paper is usually shorter and more general one, while the problem of research has to be formulated as precisely as possible. By formulating the problem with the help of making some interrogative sentences a researcher is directed toward specific fields of science. The research of one field of science is *disciplinary research* and the research from the point of many fields of science is *interdisciplinary research*.

DEFINITION OF NOTIONS AND NOTIONAL ANALYSIS

Science is an activity of acquirement of knowledge and it is based on appropriate assumptions and implementations of precise procedures for purpose of logically classified and theoretically coherent expressions regarding empirical reality. Within a research one should make difference between a thought on something from something that is thought about. Not making difference between a notion (a concept) and something that it relates to is called an error of reification. This error is not a rare one and due to it somebody might often make wrong conclusions. A notion is not the reflection of an experience from real life, but it is a creation of the mind based on the experience transcending this experience itself and offering managing of new situations and this is why in each scientific notion there are hypothetic elements.[8] Concepts are not *a priori* categories of thought. They are historical categories that might be changed, because a researcher's findings get changed and in this way objective reality which the researcher had found out might get changed, too. Each notion has its related accompying term. The term has nothing to do with what it means, except that people have agreed that a certain word means that what they agreed upon it to mean. Meaning cannot be derived from a word that means a term, so it is not necessary to change the expression by the change of the meaning of the term, because such a risk has its own logic as well. A generally accepted procedure within a notional analysis has not been found yet, but some authors have given certain recommendations regarding it.

Good and Hatt have recommended that: a list of main notions is carefully selected; that for each notion it is necessary to carefully determine meaningful elements in the way that a researcher uses them in practice; it is necessary to take published literature into consideration and discover various uses of expressions that demand definition; a notion that needs to be defined has to be determined in relation to other similar notions to it within the same field of science or in other fields of science and in the end to define higher and lower level of generalization and connect them, because science deals with concrete things in order to reach general knowledge.[9] A research starts and ends with notions. This is why the development of science of security is characteristic for its enrichment of content by notions and for an increase in number of the notions, while the development of security as science is measured by development of its notional network (its map of notions). Hence, regarding the notional network it is not sufficient only to consider overall content of a term, but it is very important to take an exact term relevant for the practice of a researcher out of the whole content of the notion. Therefore, in case of the notional analysis it is not sufficient only to generally define a term, but in addition it is necessary to give a specific definition of the term. In case of the notional analysis in addition to providing an interdisciplinary definition it is also necessary to provide a disciplinary definition from the point of research of a certain problem in the field of science of security. Often, it is also necessary to provide working definitions that are narrower than disciplinary definitions.

If within the notional analysis a researcher reaches conclusion so that it becomes necessary to abandon previous meaning of a term, it is necessary that the researcher gives appropriate explanation for it. In addition, the researcher has to explain why he/she opted to consider this meaning to be the most appropriate regarding the term. After this the researcher has to provide a characteristic definition of the notion, so that the essence of the notion is defined by a higher generic notion and

7 Miroslav Vujević, *Uvod u znanstveni rad*, Informator, Zagreb 1988, pp. 41-43
8 *Ibid*
9 Viljem Gud, Pol Het, *Metodi socijalnog istraživanja*, Vuk Karadžić, Beograd, 1966, pp. 48-53

specific difference. In case that it is not possible to provide the characteristic definition, it is necessary to select the one which determines the content of the term as precisely as possible. As the notions are the carriers of meaning, the notional analysis may also appear in the end of research, so that in definition of a meaning of a term there are used results of the conducted research. A researcher may warn about difficulties in defining a term and leave it undefined in that way. Empirical reseach cannot be conducted if the key terms are not defined. Working definitions in empirical researches are often theoretically poor ones, because the researcher faces an imperative of defining. This is why within a research it is necessary to dedicate great attention to the notional analysis, so that impoverishment of notions is avoided. However, despite this it happens that sometimes working definitions are very narrow ones, so researchers gladly avoid them and in this way they make even a greater mistake. It is necessary to make the notional analysis for each and every research, as it leads a research to provision of definition of the key notions. During the whole research, the researcher has to hold on to the given definitions, as without them the research cannot follow the logics of coherent thinking process. During each research, the researcher has to keep in mind all the key notions. In particular, the researcher has to focus attention to the notion relating to a dependant variable. For some notions the notional analysis is not necessary, but it is necessary to provide a precise definition so that their ambiguity does not harm the logics of thinking.[10]

DEFINING OBJECTIVES OF RESEARCH

Discoveries do not appear easily and they are the fruit of conscious activity. Each conscious activity, including scientific research too, is directed toward achieving a certain objective. It is the curiosity which encourages a researcher to start his/her research, so the objective of scientific research is gaining knowledge. However, if the objective of the research was formulated in such a general way, this could not be very helpful in the process of research. The objective of all activities is knowledge. The objective of a certain science is gaining knowledge on a part of objective reality which is selected as an object a research. The objective of a determined research must be a much more creative one. As much as the objective of science is related to its object of research, that much necessary is to relate the objective of a certain research to its problem. Therefore, it is necessary to underline that the objective of each research is to discover that something that the researcher defines as unknown, is a problem.[11] In case of the problem of research, a researcher asks her/himself: "What is this like, how is it related to something else, how is it changed throughout time, what will it look like in future", etc. Therefore, regarding the problem of research the researcher keeps making questions regarding certain levels of research. However, the researcher may be encouraged for the research by some practical problem, too. Therefore, there are two kinds of objectives in scientific research: *pragmatic or social objectives* (what will the researcher gain in case of practical implementation; general contribution to some larger community) and *cognitive or scientific objectives* (to what level of knowledge the researcher decided to go – presentation, description, classification, proving…). Prior to making a hypothesis, the researcher must define temporal and spatial determination of the research.

MAKING A HYPOTHESIS

A hypothesis determines a plan and framework of a research. The hypotheses are unconfirmed claims (assumptions) that need to be confirmed factually through a research. Most often, the hypothesis (Greek *hypothesis* – assumption) is based on a mutual relation of certain variables. They are made on the basis of some indicators – personal experience, knowledge, analogy, scientific theories, etc. on relations between some phenomena. By their orientation the hypothesis[12] may be: *affirmative* (affirming some relations); *negative* (negating some relations) and *neutral* (a null hypothesis). The hypothesis (hypothetical framework) most often consists of: a central, main, basic or leading hypothesis and a great number of ancillary hypotheses - elaborating (collateral) hypotheses. Due to a great significance of a hypothesis for a process of research, many authors gave their

10 Miroslav Vujević, *op. cit*, pp. 53-54.
11 Radoslav Gaćinović, Metodološki proces u pisanju naučnog rada, *Vojno delo*, Jesen/2010, p. 18
12 On difference between hypothesis and prognosis see **Momčilo Sakan**, *Hipoteze u nauci* (Second Edition), Prometej, Novi Sad 2005, p. 31

definitions of the hypothesis and this paper underlines the most significant ones: the hypotheses are cognitive theoretical supplements (complements) to certain gaps in the knowledge of a particular phenomenon or a whole field of phenomena whose certain moments, parts or aspects are already well-known.[13] A hypothesis is a standpoint or a complex of standpoints of undetermined cognitive value by which it is attempted to explain certain empirical or theoretical facts, hypothetical objects, phenomena, processes or relations.[14] Hypotheses are theoretically basic cognitive and object-related assumptions that yet have to be proved by results of a research.[15] A hypothesis is a meaningful, informative and factually verifiable testimony about a supposed relationship between two or more variables.[16] Answers to the hypotheses (the results of research) are conclusions of the research. The hypotheses have to fullfil the following demands: they have to be related to *phenomena* which exist and which can be scientifically verified; *a statement*[17] - a hypothesis has to be clear, precise and logical; *the contents* of a hypothesis must be empirically checked and they have to assume a solution to a problem of the research. A qualitatively and precisely formulated problem of the research directs researchers to making better hypotheses. The hypothesis of the research is a cognitive answer to a question in a problem and to a great number of questions it is possible to give a greater number of cognitive answers. Therefore, each hypothesis is only one of possible answers to a question which is made within a problem of the research. A correct answer is not known to a researcher, so each hypothesis is a cognitive step toward a field of unknown. Therefore, in case of every research the highest risk for its success is making of hypothesis. There is no good research if the hypotheses are bad, but also the research might be bad even if the hypotheses are good. Hence, it is not easy to make a qualitative hypothesis within a research, because the researcher faces lots of obstacles in the process. Šešić presents the following points regarding it: insufficiently fundamental and detailed knowledge of some fields of research; the absence or lack of knowledge regarding a theoretical framework from which standpoint a hypothesis is made; the lack of capability of using appropriate theoretical framework, starting from the lack of knowledge of logical basis of cognitive framework for making a hypothesis, from incapability of using general theoretical model to incapability or the lack of invention in making a right hypothesis. A hypothesis can be too general or wide, so it is difficult to define or specify. Additionally, the hypothesis can also be too specific or too narrow. A line of obstacles in making an appropriate hypothesis derives from a failure to recognize appropriate methods of research and techniques of testing the hypothesis.[18] Hypotheses are a step forward to new knowledges. Sometimes they overstep theoretical frameworks of old knowledges and question them. What a theory is in science that is a hypothesis in research. In the way that a theory invents or formulates an object of researcher, the same way a hypothesis formulates a research of a certain problem. Sometimes a researcher might not be capable to express a precise standpoint regarding the problem and so he/she makes a hypothesis as an orientation for the research in order to make it more precise or substitute it later in the process of the research. Such hypotheses are called working hypotheses.[19] Good hypothesses have to fullfil a great number of criteria: the hypothesis has to be *accurate*, the right one – it has to relate to the problem it researches; the hypothesis has to be *notionally* precise; the hypothesis has to be *empirically verifiable*; the hypothesis has to be connected with *available techniques*; the hypothesis has to be *specific*; the hypothesis has to be connected with theory.[20] Just as it is possible for a research to have many objectives, it is possible that the research has many hypotheses as well. When a researcher has many hypotheses, the question of their sorting appears. The most logical way to sort them is to sort (aline) them taking into consideration the level of knowledge – in first place come the ones with descriptive content that are called general hypotheses and then come the hypotheses with a classifying content called collateral or accompanying (elaborating) hypotheses. This phase of the research ends with formulation and sorting of the hypotheses. However, the research itself does not end here, but it continues with an empirical part which is based on the hypotheses.[21]

13 Bogdan Šešić, *Osnovi metodologije društvenih nauka*, Naučna knjiga, Beograd, 1977, p. 208
14 Zaječarević, G, *Osnovi metodologije nauke*, Naučna knjiga, Beograd, 1977, pp. 187-190
15 Slavomir Milosavljević, *Istraživanje političkih pojava*, Institut za političke studije, Beograd 1980, p. 97
16 Ristić, Ž., *O istraživanju, metodu i znanju*, Institut za pedagoška istraživanja, Beograd, 1995, p. 310
17 O pomu iskaza šire u: Marković, M., *Logika*, Zavod za udžbenike i nastavna sredstva, Beograd, 1994, p. 40
18 Bogdan Šešić, *Metodologija društvenih nauka*, Naučna knjiga, Beograd, 1974, p. 213
19 Detaljnije o funkcijama hipoteza u: Momčilo Sakan, *op. cit.*, p. 78
20 Viljem Gud, Pol Het, *op. cit.*, pp. 66-71
21 Radoslav Gaćinović, Hipoteze u naučnom istraživanju, *Politička revija*, God. (XXI) VIII, Vol. 20, br.2/2009, p. 283

IDENTIFICATION AND CLASSIFICATION OF VARIABLES

Hypotheses are a researcher's idea on processes and phenomena in objective reality. According to Hegel, a thought is both *deaf and blind*. However, scientific thought is related to *the reality that can be heard and seen*. Therefore, in scientific research *the truth of scientific thought* is checked by "listening" to the reality that is thought about. In case of the problem of research, the researcher makes questions about some traits (attributes, marks) or about a relation between certain traits.[22] In the hypothesis there are given answers on the traits and the relation between traits on the basis of knowledge, intelligence, imagination and intuition. These traits are changeable and that is why they are called *variables*. The variables are changeable sizes (measurements) of which a researcher claims something in the hypotheses. The researcher is not equally interested for all variables that appear in a research. Those variables that are in focus of the researcher's interest are called *dependent variables*. The dependant variables are marks or traits of the phenomena that are the most interesting for the researcher, so this variable is connected with other variables which describe, classify or explain it. The variables that describe, classify or explain the dependant variable are called *independent variables*. The dependant variables are always in the problem of the research. In fact, they are the trait (the mark) that the reasercher makes question about regarding the problem of the research. Frequently, *intervening* or *interpretative* variables appear in social questionnaires. They appear after independant and before dependant variables and they cause a correlation between these variables. Considering measuring characteristics, the variables are divided into qualitative and quantitative ones and in relation to the direction of variation of quantitative variables they can be unipolar and bipolar ones. The unipolar ones vary in one direction, from zero to its maximum, and the bipolar ones vary in two directions to the maximum.[23]

INDICATORS IN RESEARCH OF NATIONAL SECURITY

Hypotheses are an opinion of a researcher regarding a trait of one variable or a relation between two variables. Notions are basic categories of thinking and so the hypotheses deal with the notions and inter-relations. The notions are an idea of essence of an object, phenomena and process. If a researcher wants to check the validity of the hypotheses, he/she cannot stay limited to the interpretation of only the notional level of it, because the idea of essence of objects, phenomena and processes transcend objective reality. Scientific phenomena are formed through thinking that is based on the facts of reality. A notion is formed through abstraction of unimportant elements and facts and generalization of important elements and facts. The notion is cognitive explanation of the facts. In contrast to an experience of sense a thought (notion) generally "reflects" objective reality. The path of formation of the notion goes from objective reality and sensory experience to thinking. This process is called *conceptualization*. For purpose of empirical check there must be made an inverse way that goes from thinking to objective reality. This procedure is called *operationalization*. The parts of objective reality that are related to the notion of variable that a researcher wants to operationalize are called *indicators* or *marking posts (indices)*. A term for definition of the notion "indicator" (indication) derives from a Latin word *indicare*. Its basic synonyms are: trait, announcement, insinuation (indication), symptom, data, pointer, pointer (road sign), foundation for some doubt, etc.[24] Slavomir Milosavljević gives a very acceptable definition of indicator: "Indicators or markers are external manifestations of internal essence."[25] An indicator has to be *accurate*. It means that the indicator has to relate to a measurable variable. There are four ways of determination of accuracy of an indicator: aprioristic validation as a procedure which in advance proclaims that the researcher's indicator is accurate, without any check; logic validation as a procedure by which the indicators are found on the basis of definition of variables that the researcher wants to operationalize. An operational definition is a definition of variable by indicator. A logic validation increases probability that the researcher has good indicators at his/her disposal, but in this way the researcher cannot be sure that he/she has accurate indicators. Therefore, the indicators that show greater differences between contrasting groups are more accurate. [26]

22 Radoslav Gaćinović, Varijable u naučnom istraživanju, *Politička revija*, God. (XXIII), Vol. 28, br. 2/2011, p. 9
23 Ibid, str. 11
24 Mala enciklopedija prosvete, Vol. I, Third Edition, Prosveta, Beograd, 1978; Klaić, B., Rječnik stranih riječi, *Ibid*, p. 624
25 Slavomir Milosavljević, *Istraživanje političkih pojava*, Institut za političke studije Beograd 1980, p. 110
26 Radoslav Gaćinović, Indikatori u naučnom istraživanju, *Politička revija*, God. (XXI) VIII, Vol. 21, br. 3/2009, p. 229

An indicator has to be *objective*. The indicator is objective when results that are obtained by its use depend on the content that is measured and not on somebody who makes the measuring. The indicator has to be *reliable* (*trustworthy*). The reliability of an indicator shows how a researcher must rely on the indicator when measuring a variable. The indicator must be *unambiguous*. This means that the indicator must be so clearly and precisely defined that various subjects know exactly what this indicator refers to. The indicator must be *precise*. A precise indicator provides that through its use the researcher can register even smaller differences in sizes of a variable. Indicators must be *representative*. Operationalization of variables connects theoretical and empirical levels of research. Therefore, in the process of research the researcher's opinion does not end with its theoretical part. It continues as long as the research lasts and it is only that in certain phrases of the research the opinion gains specific forms. While in theoretical part of the process of research *contemplative activity* prevails, in empirical part of the research it is *performative thought* that prevails.[27]

DETERMINATION OF A PLAN OF RESEARCH IN THE FIELD OF NATIONAL SECURITY

When making a plan or an outline of research in the field of national security, firstly a researcher has to make decision on what kind of methods he/she will use for the data collecting in the research. Then, in accordance with overall logics of the research, the researcher has to decide *who* is the one who can make the most reliable data of interest to the research, and also *where, when* and *under what circumstances*. In the research plan it is obligatory to determine *a sample* for research. There are two kinds of research plan: *descriptive and casual research plans.* If the researcher wants to gain a general insight into some trait or point, then it is necessary to provide measurement of the trait on a representative sample regarding it. However, if the researcher has a classifying objective, the researcher must provide representativity of the measurement of each trait that will be classified. In both cases a descriptive research plan is necessary to be done. Therefore, the *descriptive* way of research primarily has to provide a representative sample. In addition to it, in case of the descriptive research plan, it is necessary to decide who can offer the best data that are of interest for the researcher, in what way the researcher will collect the data (observation, questionnaire, interview, content analysis or combination), where the researcher will collect the data (on working place, at home, at school, at a meeting…), when he/she will collect the data (during working time, after working time…) In case of *casual* way of research, if the researcher is asked about casual-consequental relation in the problem of research, the objective of this research will be explanatory one and the hypotheses of casual content and the plan will be casual ones. The casual research plan always includes a descriptive plan, as it is not possible to define casual-consequental relation if prior to it the research team does not know the description of the phenomena whose casual relation it wants to research. Due to this, all that is required for a descriptive research plan is also required for a casual research plan. In addition to this, the casual research plan must meet some specific demands. A basic demand is that in addition to an experimental group it has to have a control group as well. These groups are formed under certain logical rules that provide for a casual analysis. However, in practice there are a great number of various kinds of research plans and in particular: s*uccessive research plan* consisting of only one experimental group. The research is conducted in the way that firstly a dependant variable is measured. Then, an independent variable is introduced and after that the dependant variable is measured again; *expanded successive research plan* can be used if independent variable is measured under control during the research; *comparative research plan* consists of several groups in which only dependable variable is measured; *controling experimental research plan* has a control group which wants to equalize with an experimental group in all aspects except in performance of independent variable; *transversal research plan* with help of intersection in research of some phenomena or process provides keeping the track of time and *longitudinal research plan* keeps track of a certain trait of all respondents in the time and in this way it controls various influences.[28]

27 Miroslav Vujević, *Uvod u znanstveni rad*, Informator, Zagreb, 1988, pp. 66-75.
28 Radoslav Gaćinović, *Metodološki proces u pisanju naučnog rada*, *op. cit.*, p. 20

SCIENTIFIC METHODS IN RESEARCH OF NATIONAL SECURITY

The framework of scientific methods is determined by content of the research, its object and kind of research. The researcher has to present and project scientific methods, to shortly describe them (their good and bad sides) and explain why exactly these methods were selected, having in mind that a hypothetical framework and objectives of research suggest the selection of the methods for research. The basic methods of scientific thinking and research in social sciences are *analytical basic methods* (method of analysis, method of apstraction, method of specialization, deduction as a basic method of scientific thinking) and *synthetic basic methods* (synthesis, concretization, generalization and indiction as basic scientific methods). In addition to these methods, in case of scientific research, important ones are *general scientific methods in social sciences* (hypothetic-deductive method, statistic general scientific method, general scientific method of modeling, axiomatic method, analytical-deductive method and comparative method).[29] Collecting the data is a characteristic of every scientific research and it can also be claimed that it is the characteristic of generally every research. With the data collecting the scientific research reaches the reality in which it checks correctness and accuracy of a derived thought regarding the reality. On the basis of this thought, the researcher determines what facts are interesting for the research and under what circumstances these facts will be collected. After this, the researcher determines the methods for the data collecting. Within this process the researcher must differentiate the phenomena and processes from the facts and data. The phenomena and processes are a part of objective reality. The facts are sensory experiences and the data are symbolically registered facts.[30] By these methods of the data collecting, the researcher "listens" to the parts of reality that he/she thinks about them in order to obtain the information regarding them. Just as an indicator must be related to a variable, a data also must relate to a phenomenon. Consequently, the data have to be *true (truthful, accurate)* and in order to meet this demand in detail a particular attention should be paid to the selection and elaboration of methods collecting the data. Therefore the data depend on the traits of the variables which are of changeable size and which vary qualitatively and quantitatively. Consequently, the changes of the variables can be found out through *measurement* and *classification*. Each collecting of the data in scientific research is measured in a certain way. The variations of the variables regardless of the fact whether they are quantitative or qualitative ones are encompassed by measuring. In order to conduct the measurement in the most qualitative way various kinds of scales for measuring in collecting of various data are used. *The basic methods for the data collecting are questioning, observation, experiment, operative methods (case study, analysis of documents, testing in researches, biographic method), field work, the data control. Questioning* (interrogation) is a method of collecting empirical data by the way of collecting statements from respondents, primarily oral statements as well as writing ones.[31] *Observation* is also a very significant method of collecting the data. In observation there is no a mediator between objective reality and empirical contents regarding it and so the path to obtaining the data is the shortest one. In direct relation with objective reality the observation gives a rich primary experience and an integral experience of objective reality. Therefore, this method of the data collecting can serve as a method for discovery and method of verification. For purpose of the discovery the researcher uses non-systematic observation and for the needs of verification the researcher uses systematic observation.

Frequent weaknesses in the process of research in the field of security derive from a selection of wrong methods. However, a method itself has some weaknesses which in particular become evident in the research of social phenomena, such as, for example, that: it is possible to observe only that what exists or happens during the process of observation; the observation encompasses only external manifestations of phenomena and processes; in the process of the observation the data are collected very slowly; in a society it is possible to observe only that what happens in public. The presence of the observation can influence a flow of the phenomenon that is observed. Social phenomena are complex, so by observation a researcher can encompass only a part of that what he/she wants to observe. This weakness can be reduced by including a larger number of observations for purpose of encompassing the whole observed field of the research; Preparations for observation of

29 Slavomir Milosavljević i Ivan Radosavljević, *Osnovi metodologije političkih nauka*, Third Edited Edition, *Službeni glasnik*, Beograd, 2006, pp. 200-284
30 Miroslav Vujević, *op. cit*, p. 47
31 *Ibid*, p. 49

social phenomena are very difficult, because it is difficult to predict the time and place of emerging of the phenomena that the researcher wants to observe.[32]

The method of observation in the research of social phenomena has been rarely used in the past. There were more other factors than weaknesses that limited the use of this method. First of all, social dualism was more obvious in the field of social sciences than in the field of natural sciences. *Experiment* is a way of collecting the data through direct sensory observation by the use of auxiliary technical tools or without them.[33] The possibility for the use of experiment is conditioned by the following three moments: the nature of the phenomenon and object of the research, the stage of development of theory and methodology of certain science and ethical moment. Experiments in social sciences are divided on *real experiments* and *quasi experiments*. Real experiments are laboratory experiments and experiments in natural conditions and quasi experiments are natural, *ex post facto* experiment and simulation or a model experiment.[34] Operative methods of the data collecting have characteristics of contemplative (thinking) and organizational units, but they also include traits, techniques and procedures of other ways of the data collecting. The operative methods of the data collecting include: *case studies* whose objects of research can be only the units of social reality which within an overall social reality can be identified and defined as comprehensive specifities in time and space. *Analysis (of content) of documents* is treated as an auxiliary former method, etc. *Testing in researches* is a widespread and often used method in overall practice of research. Its most widespread significance is testing, a method of testing capability, knowledge, skills and psychophysical reactions. The word "test" or "testing" as a procedure of accomplishment of a test derives from a Latin word *testorari* the basic meaning of which is "testify" or "prove". Biographic method – its basic idea is to find out a subjective component of objective situations on the basis of personal documents which have important traits of accurate sources.[35]

TECHNIQUES FOR THE DATA COLLECTING IN A PROCESS OF THE RESEARCH OF SECURITY

Special significant techniques for the data collecting are *the survey, interview and text as a technique of interrogation*. *The survey* is a special method of the data collecting by which a researcher can obtain the data regarding attitudes and opinions of respondents. The attitudes and opinions are cognitive (contemplative) facts that "differ from thinking on facts (which often are not worthy of trust)". That is why thinking about facts has to be tested (proved) with the facts of thinking, because the researcher cannot find out contemplative facts of other people only on the basis of his/her own opinion. It is not possible to accomplish it either by the method of observation, but it is possible to accomplish it by making questions and getting answers. The survey in scientific research is not only a procedure of making questions and searching answers to these questions. It is making of certain questions to a certain kind and number of people in a certan way for purpose of getting truthful answers. The survey is a technical procedure of collecting factual material by combination of a statistic method of the sample with an interview method or questionnaire[36] and in a wider sense the survey is each and every collecting of the data by making questions. However, the question can be made in various ways and regarding various things, so in connection with it it is necessary to make difference between: the survey (in a narrower sense); interview and test. In a *narrower sense* the survey is the written collecting of the data regarding attitudes and opinions on a representative sample of respondents with a help of a questionnaire.

An interview is a kind of survey in which, with the help of specially designed questions, the data regarding the knowledge, capabilities and interests of respondents are collected. In comparison with the method of observation in case of the survey the path that leads to obtaining the data is widened. It is obligatory that in addition to a researcher there is also *a respondent* and regularly *a poll-taker* (interviewer). Adding an orderer of the questionnaire to the survey, there are four roles that can be performed by four different subjects and they are: an orderer, a researcher, a poll-taker (interviewer) and a respondent.

32 Radoslav Gaćinović, *Kako napisati naučno-istraživački rad iz oblasti politikologije*, *op. cit*., pp. 271-272
33 Viljem Gud, Pol Het, *op. cit*., p. 454
34 V. Mužić, *Metodologija pedagoških istraživanja*, Zavod za izdavanje udžbenika,Sarajevo, 1968, p. 74
35 Slavomir Milosavljević i Ivan Radosavljević, *op. cit*, pp. 548-583
36 Mozer. C.A., *Metodi anketiranja u istraživalju društvenih pojava*, Kultura, Beograd 1962, p. 5

In this phase of the research it is necessary to provide answers to this question: what are basic sources of the data for the research that is being conducted? The data can be of different kind (documentation, opinions and attitudes, practice…) and they are divided into two big groups: *primary* and *secondary* data. It is necessary to mention primary data that the researcher collects on his/her own: instruments of the research (description, way of construction and their adjusting); organization, phases of the research; sample, how the sample is selected, its structure (composition) and size; the way of processing the obtained data and its interpretation (statistic and descriptive interpretation). In case of secondary data (that already exist) it is necessary to systematically present the following sources, for example: an existing theoretical thought in the field of research (monographs, textbooks, articles…); normative, doctrinary program documents; materials from scientific meetings, seminars and symposiums; scientific researches (results), statistic yearbooks, memoirs, diaries, etc.

After determining the method for the data collecting, if necessary, the researcher opts also for *a field work* part of the research. After the research is finished, the researching team or the researcher her/himself starts with *the data classification and processing* and then with *the data interpretation*. The most important moment for the researcher to take care regarding the interpretation of results of the research is connecting the data with the hypotheses that the researcher had made before it and to find out whether the data confirm or abandon the hypotheses; then, it is necessary to connect the data of the research with the data that had been obtained in similar researches; then to connect the data of the research with the procedures that were applied in the study and to connect the tested hypotheses with the starting theoretical standpoint with which the researcher started the research. In the end the scientific research ends with its publishing and so the final phase of the scientific research is *writing of a scientific report*. The scientific report on the conducted research consists of several parts: the title has to be simultaneously concise, precise and expressive, that is, it has to reflect and express the content and object of the scientific research in a precise and concise form and as appropriately and completely as it is possible. According to its title the scientific paper has to be distinguished from other papers just as one person is distinguished from other people by its name and family name. The title of the paper has to be short and to direct a reader to its content. In the process of writing of a scientific paper, the title is followed by a summary. The *summary* is a short description of the paper as the general information to a reader so that the reader on the basis of it can find out whether the paper belongs to the field of the reader's interest. On the basis of the summary the reader decides whether to read the paper or not. Each comprehensive and significant scientific paper has also an abstract written in one of universally widespread foreign languages. Its objective is to introduce to scientific community the content of the paper, the new knowledges, conclusions and results of the research in a concise form. *The introduction and problem* is a part in which the problem situation is stratified into several parts and within the process there is a certain problem that is set aside and then precisely formulated. After that, the choice of that problem is explained and then theoretical and practical importance of the research of that problem is underlined and then the key notions are defined and this research is connected with the previous ones so that on the basis of them, a hypothesis that is checked and proved in the research is made. In this part it is necessary to concisely explain everything that is important in the theoretical part of the project of the research. The researcher's objective is to prepare the reader, to "introduce" the reader to the problems that are the object of the research so that it awakens the reader's interest for them. As a rule, the introductory part elaborates a short historical preview of the object of research, its beginning and main stages of its development and solving, the relation of the selected object of research with previous researchers and the range and extent of personal research. In the introductory part the author of the paper presents and more specifically explains the problem that he/she intends to analyse, the author also presents the reasons that motivated him/her to analyze the problem of the research, then the author sums up the basic sources of information and presents the methods by which the problem is researched. *The elaboration* of the paper is the foundation of the paper and occupies most of its space. It is described and explained thoroughly and supported with documentation. The collected data for purpose of justification of the thesis in the introductory part has to be elaborated, explained and proved. In accordance with the scope of the elaboration of the paper the elaboration may have several chapters. In this part the researcher describes the approaches made in empirical part of the project of the research from identification and operationalization of variables, the sample and outline of the research to the description and elaboration of the methods for collect-

ing of the data as well as the use of the data. This part of the paper presents the results while their elaboration is explained. The elaboration clearly explains the results and their interpretation. The interpretation comprises cognitively connected theoretical starting standpoints, empirical procedures and results that are obtained. The intensive thinking in the elaboration part may lead to interesting ideas. These new ideas need to be registered and there should be a warning enclosed that this part includes the ideas obtained through the research, underlining that these ideas are different from the ideas which had encouraged the research in the first place. If the researcher does not take care of it, the researcher can easily move to other problems of interest led on the wings of imagination.[37] Hence, the researcher's creative contribution to the interpretation of the results of the research is a discovery of logical relations between the obtained results and results that had been obtained by other researchers in similar situations as well as connecting of these results with the laws and theories of corresponding science. Just like previous results have paved the way for new knowledges, in the same way the new results shed light to the previous results. This is why the interpretation of results cannot be definitive one, as some new results may become a basis for a new synthesis, paradigm and it might shed a completely new light to old results.[38] *The conclusion* is a shortened interpretation presenting the hypotheses, data and parameters that confirm or abandon the interpretation. In the conclusion the author can also underline a need for other researches that has emerged under the influence of the conducted research. The conclusion can indicate a possible practical use of the results of the research. It is a final part / the crown of the work and the synthesis of everything that was analysed. *It is possible to say that the conclusion is a moment of synthesis after the whole life of analysis.* A basic thing that is demanded from a good conclusion is that it derives from the very results of the research and that it synthetically presents general results obtained on the basis of the research and analysis. The conclusion presents the final opinion and standpoints that need to convert all previous partitions and elaborations from the past and the conlusion must also present an explanation why the paper is a contribution to science.[39] *The bibliography* presents the literature that the researcher used for the research. It can be classified in different ways. The whole literature can be presented in alphabetical order and it can be categorized as well (the basis, secondary sources, original sources, textbooks, etc.). *Real and nominal register* is presented in important synthetic papers and textbooks. It helps a lot in orientation regarding the text. *Attachments* consist of important research material which is not necessary for the main text of a scientific paper, and these are the material such as, for example, implemented instruments of the research, the outline of protocols, summary tables and similar. The attachments present only what is necessary for the scientific paper/report. A scientific report has to be distinguished from a project of the research and research documentation. The scientific report gets published, while the documentation on the research is kept and preserved as it usually consists of more material than it is necessary for publishing. The published report may encourage a discussion among scientists which consequently may announce and bring up some new ideas, so the documentation might be used later. *Writing of citations* is a separate matter in a scientific report. Many researchers use the citations as a proof for accuracy of their thoughts. However, the citations cannot be used as the proofs, even though they might be the products of thinking of some of the greatest authorities in science. However, if used well, the citations may contribute to the clarity and richness of a text.[40]

37 Each scientific research is a strong logical unit and a part of science that is a greater logical unit. That is why in case of interpretation of the results of a scientific report, it is not sufficient to connect the data with the hypotheses, but it is also necessary to connect the results of the overall research with other similar results and with theoretical ideas related to them. The conducted research should not be an isolated unit but it has to be included into a logical system of science to which it belongs to; Miroslav Vujević, *op. cit.*, p. 127

38 Tomas Kun, *Struktura naučnih revolucija*, Nolit, Beograd, 1974, p. 56.

39 Mithat Šamić, *op. cit*, p. 75

40 Citations are used in following cases: when some importance is attached to a certain hypothesis and when we express an opinion related to it. Certainly one should not forget that verifiability of the hypothesis in question is not present in the citation of like-minded authors; the citation might serve as an illustration of a thought of some other researcher. Often some problems related to this issue emerge because the citations are torn fragments that, being extracted in such a way, might be interpreted in a totally different way. It is most obvious in case of some polemics; the citations may serve as illustrations of the time and place of emergence of an interesting thought. Each thought has its history and some of them might have impact on scientific thinking, although they themselves are not very significant ones; even something nicely expressed in regard to the problem that we analyze might be cited. Nice thoughts and proverbs might serve well as an illustration of what we want to convey if they are well-fitted into the context of thinking. Along with accuracy, precision and clarity of a speech, it is also the beauty of the speech which greatly contributes to the informative value of a scientific report. However, one should not forget

The implementation of scientific methods provides intersubjective verifiability to scientific thought, because: everything that is claimed in science has to be presented in clear, precise and reasonable way; scientific standpoints must be explained and reasoned and coherent so that some standpoints can be logically derived from other standpoints and scientific thought must be practically proved, because scientific thinking is "a continuous criticism of arguments" on which its conclusions are based. A scientific research is a comprehensive activity which has to be based on the principles of logic. It must be based on a scientific theory and it has to include procedures of empirical verifications in it. Several scientific disciplines of smaller or greater range have dealt with social problems and various social phenomena from the aspect of security (Theory on the State and Law, Political system, Constitutional Law, Sociology…). If their starting standpoint is a fact that an objective of science is defining of objective reality, it is clear that certain sciences and scientific disciplines are different not only in the use of scientific methods, tools and objectives but also in the selection of the parts of reality – social, natural, technical and psychological phenomena – in their research.[41]

BIBLIOGRAPHY

1. Vujević, M., *Uvod u znanstveni rad*, Informator, Zagreb 1988.
2. Gud Vilijem – Pol Het: *Metodi socijalnog istraživanja*, Vuk Karadžić, Beograd, 1966.
3. Gaćinović, R., *Bezbednost kao moderna naučna disciplina*, Zbornik radova ''SRBIJA – bezbednosni i instiitucionalni izazovi", Institut za političke studije, Beograd, 2009
4. Gaćinović, R., Izbor i definisanje problema istraživanja, *Politička revija*, god. (XXIII)X, Vol. 27, br. 1/2011.
5. Gaćinović, R., *Metodološki proces u pisanju naučnog rada*, Vojno delo, Jesen/2010
6. Gaćinović, R., *Hipoteze u naučnom istraživanju*, Politička revija, br.2/2009, God. (XXI) VIII; Vol. 20, Br. 2/2009.
7. Gaćinović, R., *Varijable u naučnom istraživanju*, Politička revija, God. (XXIII)X, Vol. 28, br. 2/2011.
8. Gaćinović, R., *Indikatori u naučnom istraživanju*, Politička revija, God. (XXI) VIII, Vol. 21, br. 3/2009.
9. Gaćinović, R., *Kako napisati naučno-istraživački rad iz oblasti politikologije*, Politička revija, Institut za političke studije, Beograd, God. (XXI) VIII; Vol. 19, br. 1/2009.
10. Goddis John Lewis, *Surprise, Security, and the American Experience*, Cambridge: Harvard University Press, 2004
11. Ilić, M., *Naučno istraživanje. Opšta metodologija*, Filološki fakultet u Beogradu, Beograd 1994.
12. Kun Tomas, *Struktura naučnih revolucija,* Nolit, Beograd, 1974.
13. Milosavljević, S., *Istraživanje političkih pojava*, Institut za političke studije Beograd 1980.
14. Marković, M., *Logika*, Zavod za udžbenike i nastavna sredstva, Beograd, 1994.
15. Milosavljević, S. i I. Radosavljević, I *Osnovi metodologije političkih nauka,* treće izmenjeno i dopunjeno izdanje, Službeni glasnik, Beograd, 2006.
16. Mozer. C.A.: *Metodi anketiranja u istraživalju društvenih pojava*, Kultura, Beograd 1962.
17. Milić, V., Sociološki metod, Nolit, Beograd, 1965.
18. Marković, M., *Dijalektička teorija značenja*, BIGZ-Geneke štampa, Prosveta, SKZ, Veograd 1994.
19. Mihailović, D., *Metodologija naučnih istraživanja*, Fakultet organizacionih nauka, Beograd, 1999.
20. Pečujlić, M., *Metodologija društvenih nauka*, Savremena administracija, Beograd, 1989.
21. Pejčić, B., *Metodologija empirijskog naučnog istraživanja*, Hrestomatija. Univerzitet u Beogradu, Defektološki fakultet Beograd, 1995.

that the beauty of the speech or writing is a tool to express the topic that is intended to be presented in the paper; Miroslav Vujević, *op. cit*, p. 128

41 Radoslav Gaćinović, *Bezbednost kao moderna naučna disciplina*, Zbornik radova ''SRBIJA – bezbednosni i instiitucionalni izazovi", Institut za političke studije, Beograd, 2009, p. 21

22. Pečujlić M; Milić V., *Metodologija društvenih nauka*, DB Grafika, Beograd, 1995.
23. Pešić, M., *Uvod u sociologiju*, RO Institut za političke i međunarodne studije, Beograd, 1985.
24. Pešić, M.:, *Sociološke teorije*, Institut za političke studije, Beograd, 1994.
25. Ristić, Ž., *O istraživanju, metodu i znanju*, Institut za pedagoška istraživanja, Beograd, 1995.
26. Simić D., *Nauka o bezbednosti – savremeni pristupi bezbednosti*, Službeni list SRJ, Beograd, 2002.
27. Sakan, M., *Hipoteze u nauci*, drugo izdanje, Prometej, Novi Sad 2005.
28. Šamić, M., *Kako nastaje naučno djelo*, Svjetlost, Sarajevo, 1988.
29. Šešić, B., *Osnovi metodologije društvenih nauka*, drugo izdanje, Naučna knjiga, Beograd, 1977.

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METHODOLOGICAL AND ETHICAL CHALLENGES IN CRISIS AND DISASTER RESEARCH [1]

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Abstract: The history of civilization essentially represents an uninterrupted series of conflicts and periods of stability and peace, moving from radical to moderate streams, from barbarism to progress. Traditions of liberal learning have been severely shaken by the global 2008 economic crisis and the human intelligence became a weak instrument in front of the onslaught of new mega corporations willing to profit and seize new markets, undermining the objective rules of the morality. The security of the planet is at risk, and the managing, designing and dosing of the crises and disasters becomes part of the potential disintegration arsenal as a tool to seek new markets and implications. Disoriented and disillusioned people, by seeking new bases and values, easily succumb to impose "revolutions" that suppress the mind, emphasizing conflict paradigm that precisely opens massive manipulation gaps, spreading spiritual crisis and social pathology. Therefore, the twenty-first century society is in a continuous state of uncertainty, collapse, divisions and paranoia, which favours further spread of violence and insecurity, so crisis management remains as one of the global security barrier.

Keywords: crisis, disaster, political context, methodology, research, safety.

CRISIS AS A THEORETICAL PROBLEM

From the beginning of time, people in different ways tried to prevent, avoid or at least mitigate various types of dangerous and undesirable situations and to manage crises. Hatred of others, envy, material inequality, religious diversity, myths and conspiracy theories are just part of the propaganda arsenal, which explains why the solution should be sought in situations of conflict and war. The concept of crisis has evolved and developed during the time, and its meanings were often changed while its vertical and horizontal expansion and application spread rapidly even today including different situations and aspects of social life. Crisis management is both as a term and as a concept, a product of the twentieth century. In fact, the origin of the term *crisis management* is in the political sphere. [2]

Crisis management as a science is still in its early life, largely because of the difficulties in measuring, standardization and comparison of crisis situations. In addition to the general lack of consents of the crisis management measures and vocabulary, many organizations have difficulties to release the information about the structural weaknesses of management. There are real environmental sanctions - such as legal and market - acting against the current trends of transparency and accountability.

It must be recognized that the rigidity of the scientific method is not always applicable in crisis situations. It does not fit in according to Karl Popper, generally accepted criteria for the classification of an activity as a scientific activity. In addition to the complexity (and, to some extent, uncertainty) of the concept of crisis and disasters, there are two very significant aggravating factors that make the scientific research of these phenomena almost impossible, given by Bertrand Robert and Chris Lajtha (Robert and Lajtha, 2002). Here is the point:

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2 It is claimed that U.S. President John F. Kennedy first used this phrase during the Cuban crisis in 1962 when the U.S. confronted the Soviet Union due to installation of Soviet nuclear warheads missiles in Cuba leading the world to the very edge of the World War III. In that way, Kennedy described the management of a serious, emergency situation. (Milašinović, Kešetović:2011).

- Crisis is an event that is relatively rare. As a result, many forms of numerical validation or statistical approaches are, therefore, much harder applicable;
- Crisis is an event that cannot be reproduced. Each crisis situation is unique. The idea of its reproduction or the ability to reproduce the event in experimental conditions is not valid. In that sense it is not possible to carry out successive and hypotheses tests based on an identical experience;
- It is not possible to detect the error in the existing and proposed theories. No one can prove without a doubt that the different treatment of the crisis had a different (acceptable) result;
- It is not certain that a real life experience would really look like that set in the scientific model. Fabricated crisis are impossible to be tested in real life;
- Experiments with living subjects are not an option. For obvious ethical reasons it is not possible to set the explosion at an industrial plant or launch a biological attack, in order to measure the effects of different responses to these events;
- The price of experiment is unacceptable. When wagers include human lives and the great impact on social infrastructure, experimentation is simply unthinkable; and
- Researchers earn for living by publishing. Very few decision makers are willing to open their doors to researchers and permit them to observe and write about how they manage the crisis. When the crisis is in its so-called acute phase, crisis researchers are omitted form crisis command center.

Second, researchers are rarely allowed and permitted to witness the crisis itself.

- Even when researchers are invited they tend to question managing models and beliefs. They have a number of uncomfortable questions, while managers want immediate advice for action ("I called you to give me a solution, not to question me."). And that's why researchers are not invited.
- In the stage of collecting feedback information, the available information is partial and flawed. Power play, potential legal repercussions can cause lack or corruption of information.
- As witnesses' experts, researchers may be forced to answer questions made by public authorities (boards of inquiry, courts, etc.) on how to manage the crisis and the quality of crisis preparation, which may have implications to the members of the crisis team and the responsibility of the company or organization affected by the crisis.
- Paradoxically, pre-crisis phase of the crisis are more accessible to researchers because they appear to have fewer barriers. However, very few organizations are interested in this phase of crisis management.

Based on the presented it is possible to understand why there is a relatively small number of researchers in the field of crisis and crisis management.

Basically, crises and disasters researcher faces with the same methodological problems as well as researchers in all areas of behavioural and social sciences research. However, the crisis situation itself creates new and specific problems or increases standard and already known ones that the researcher has to deal with. (Killitm, 1956). The main tools in the crises and disasters research - a theory, a hypothesis, an appropriate research design, selection plan for the research study, a strategy for collecting data or documentation of observations, and the way to understand the meaning of the collected material - are more or less recognizable and similar to those used in other social sciences.

The main difference between the research of crises and disasters and other phenomena is primarily in the context in which it is implemented (Mileti, 1987:69; Taylor, 1978:276). The bigger differences between normal (everyday) situation and the context in which other studies are conducted in the social sciences and the context of the crisis, the greater the challenge for researchers (Stallings, 2002b :21-22). This means that the research carried out during the period of acute crisis is facing the challenges which are not in phase prior to the crisis (the mitigation and preparation), but also after the crisis has passed (in the later stages of recovery from past crises).

The core of the difference between "normal" and the research during everyday conditions and research in crisis conditions, Stallings reduces to:

(1) Time, that is when the process of observation and data collection and other material begins with regard to the beginning of the crisis/disaster;

(2) Access, which refers to the initial contacts of researchers with subjects that are to be interviewed, the respondents in the survey and those who have documents and other relevant materials; and

(3) Generalizability, or what the Killian calls the ability to draw valid conclusions from studies of crises and disasters (Killian, 2002:56).

While many of these problems have only partial solutions, triangulation of certain research patterns that use different methods of disaster research can provide valid conclusions. Of course, these three dimensions are interrelated: the ability to generalize research findings of individual crises and disasters is directly affected by successful solving of the problem of timing and approach, while the access to the relevant subject is associated with the issues of the time dimension. (Stallings, 2007:56)

ETHICAL DIMENSIONS OF CRISIS AND DISASTER RESEARCH

Ethical concerns related to the consequences of researchers actions during and after the disaster, during the research process, and even after the research formally ended. Most important questions concern the impact of different forms of data collection on the lives of the investigated subjects.

Ethical research standards for (and for universities IRB[3]) can be expressed by the phrase "do not harm" (Babbie, 1995:449-450). However, during the crisis the researchers themselves are involved in lives of people in the worst possible moments. The question of their special responsibilities during interviewing process arises as the investigated subject lost their loved ones, became roofless and/or without their property. The same questions can be asked when the individuals and services that directly respond to the crisis situation and trying to direct it, are observed.

Researchers usually considered this acceptable and necessary to gain knowledge that can be used to reduce human suffering and improve crisis responses in the future. Physical, psychological and emotional price of this research is allocated to different subjects.[4] This raises the dilemma of how deep to question and press the disaster victims, whether some questions should be avoided, whether to terminate or continue the interview if the emotions prevail and later on try to continue, whether researchers should accept the participation in some tasks of the crisis response if they are asked by the members of the relevant services, and that there is no one else to do so.

Another kind of problem arises when researchers collect data, information and documents that they sought for. One question is related to confidentiality. After the subjects were assured that their statements and comments remain confidential, would the researchers keep their promises? When presenting the results of the victim, it can be specified with a number of characteristics that describe his/her social status (such as "29-year old single mother of four who lost her home"), but how to conceal the identity and preserve the confidentiality of observations of mayor or police chief when the data presented are related to their actions during the crisis? In countries like the United States, courts do not recognize the data obtained by the researchers from their subjects as a form of "privileged communication", as in the case of priests and lawyers. (Babbie, 1995:451). What is that researchers can promise to the interviewed subjects about what will happen to their observations, and who would later have access to them?

In most discussions concerning the research ethics, the starting point is the fact that researchers are trying to maintain a neutral or unbiased position, at least when it comes to their research role. However, the temptation of crises and disasters researchers to take one's side is especially great. This dilemma, of course, is not unique just for the disaster research, but also is present, for instance, in studies of social problems and deviant behaviour.

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3 Institutional Review Board - IRB, also known as the Independent Ethics Committee – IEC) or Ethical Review Board – ERB is the unit formally established to approve, threat and review biomedical and behavioral research in which people are included. In the U.S. Food and Drug Administration – FDA and Department of Health and Human Services authorized the IRB to approve, require changes in scheduled research prior to their approval or to prohibit research. IRB are responsible for critical insight of the researches that include human subjects.

4 This does not mean that the researchers themselves do not pay for the research since they witnessed human suffering and physical destruction immediately after the disaster strikes. The key difference is that, in the case of researchers, this is the result of their decision to expose themselves to the disaster, but not of their subjects. While researchers can return to normal life within a few days, those affected by the disaster will longer live with its consequences, quite often for a lifetime.

Sufferings of the disaster victims are striking. Emotional testimonies often, implicitly or explicitly, are pointing to errors and omissions in the conduct of the relevant organization in charge of handling the crisis, as well as the predatory practices of local, national and international officials and organizations. In this context, it is very tempting to look at the influence of sympathetic stories of disaster victims in contrast to the view of unfeeling bureaucrats, especially with regard to the shifting of the focus of research to vulnerable populations in crises and disasters (children, elderly, women and the poor). However, taking one's side does not change the purpose of the research, which was a disaster, as in all other social sciences, it is an understanding of the world around, through finding patterns, development and phenomena patterns. To achieve this goal the words and statements of the investigated subject must be treated as "data" that have to be interpreted and understood, and not as an objective reflection of the reality. This applies to all subjects regardless of their location and position in the social hierarchy, or the specific circumstances in which they were in the disaster.

Research contribution to knowledge about disasters and reduction of human suffering is greater if researchers distance themselves from the event, rather than if they are engaged with them during the research. The superiority of this research position is a clear overall picture of events that can be obtained this way. At the same time, it does not mean the exclusion from the event in other aspects of professional and private life, although it is not quite easy to distinguish.[5]

Ethical problems related to the crises and disasters research are more visible in the events that have become controversial in the political sense. Accusations, suspicion and finger-pointing to the researcher makes the researcher in some sense more evident for all parties involved, both in the data collection phase and later phases.

At the time when the interviews were conducted, with collected data and obtained documents, the most serious ethical dilemma can appear in front of the researcher, of which the critical one is to maintain the key promises of confidentiality given to the subjects, and that sometimes can have legal consequences. So, Tierney describes the experience of several investigators that the company Exxon sued in connection with their investigation after the oil spill from the tanker Exxon Valdez in Alaska, which caused one of the biggest environmental disasters in history. She also points to the increase of SLAPP (Strategic Lawsuit Against Public Participation) suit whose intention was to intimidate critics, to silent and financially burden them. (Tierney, 2002b :356-357). At the heart of this lawsuit is the access to research data, including the identity of the subjects. There is no consensus among researchers whether it is possible to protect the identity of the investigated subject and whether it is something ethically to promise, considering the current legal climate, particularly after the events of September 11th when it comes to movement of privacy and extension of the rights of the state authority.

Certain changes in the field of crisis and disaster research have been accelerated by the terrorist attacks on the United States in 2001 and have made the crises and disasters research more difficult. The most prominent are those related to the demands expansion and precise rules and conditions made for the university IRB. The assumption is that the disaster victims, such those 9/11 survivors, went through serious emotional trauma that made them fragile and that they need special protection from the researchers.

Research manager is required to assure that the project results would bring practical benefits, a written description of the project with a clear indication that participation in the survey is voluntary, printed and signed permission form and detailed description of the approach and handling with the data collection, how they will be kept and to whom (and under what conditions) will be available. Previous approval regime can shift the beginning of the research which in crisis situations can have consequences, since some phenomena and reactions are elusive and immediate.

5 Even Max Weber pointed out that researcher's personal values affect the selection of research topic and that not only in social science research is driven by practical problems, but also that the practical problems arise from the personal values of the researcher. But he points out that scientific objectivity is not the same as moral indifference. But the research methods in social sciences, whether applied to the study of disaster or some other topic, will not produce empirical results that will point to the "correct" course of action (Weber, 1949). Based on this, Gusfield notes that research in the social sciences cannot solve social problems or solve the moral and political conflicts. It is more likely that research results extend our understanding of alternative interpretations of events and choices of possible solutions. When these choices include recommendations on what is to be done concerning the disaster, then personal values and beliefs of the researcher are included within. As long as this is clear to researchers and others, a line between involvement and dissociation from the events is maintained. (Gusfield, 1984:48)

Individual self-organization and self-protection tendencies have been intensified. The organization seeks not only to manage their public image, but also to move toward the researchers (Tierney, 2002b :359-362), so that some researchers have the impression that, in the mentioned context, the investigated subjects' fear of revenge of their superiors in the organization has increased. Also, the lower level hierarchy members within the organization more often avoid researchers, and the story vision and image is given by the ones at the commanding positions.

The most evident effect of 9/11 on disasters research is the increased security concerns in key organizations responding to the crisis. Access to crisis operation centers where researchers can observe first-hand operations and make initial contacts for future interviews and collect the document has become very difficult. Conducting formal interviews in organizations that are also concerned about the security is no longer as simple as it was.

TOWARDS A METHODOLOGICAL FRAMEWORK FOR THE CRISES AND DISASTERS RESEARCH

There is a need for research studies that would follow different paradigms in order to improve our understanding of crises and crisis management, that include:

- The application of chaos theory and complexity to the crisis and disaster;
- Positivistic approaches in order to quantify levels of readiness and reactions to crises and disasters and to help in predicting incidents through modelling using computer simulation;
- Phenomenological approach in order to explore the attitudes and opinions of managers in the public and private sectors on the management of crises and disasters; and
- Case studies in order to test models and concepts of the crisis management surroundings.

Such research approaches should provide additional insight into crises and disasters and contribute to better understanding of the chaos and changes, which probably helps industry and public sector to accept these incidents as part of everyday life and to get ready for them and plan, when they happen, how to operate in a strategic and holistic manner, minimizing their negative consequences for the economy and society. As the crises and disasters multiply, the managers and planners skills in both private and public sectors will be increasingly important.

As part of a research project Management and Leadership in Crisis, among others, a practical goal of creating a unified methodology for the study of management and leadership in a variety of crises has been set. This methodology would represent the foundation and the starting point for studies of individual crises and crisis management and leadership in the Republic of Slovenia. In that sense, the Reminder for crisis management and leadership study was designed.

The Reminder is made on the basic understanding of the crisis, in which the crisis is set as an actual threat to the basis and norms of the social system and its subsystems. For crisis, a time pressure and unclear circumstances that require rapid decisions of the relevant individuals, agencies and institutions, are of importance. The process of making and implementing decisions often require different institutional paths and connections than usual or approved for normal non-crisis conditions and require activation of previously set mechanisms of the crisis management leadership. The crisis is closely bounded with the phenomenon called crisis management and leadership, which can be defined as the design procedures, agreements and decisions that affect the course of the crisis, and the scope, organization, preparation, action and resource allocation in order to conquer it. Crisis management and leadership normally takes place in the organizational chaos, under mass media pressure, in stressful conditions and in the lack of accurate information, with just few most important features.

The Reminder is methodologically primarily derived from cognitive-institutional approach to the study of crises and crisis management and leadership, which is being developed within the framework of the European Crisis Management Academy and research project Crisis Management in Europe. Cognitive-institutional approach focuses on the analysis of numerous individuals, groups, networks and institutions in crisis and in that sense represents the perception, knowledge of people skills, dealing with crisis, as well as group and institutional framework in which decisions are made. In addition, during the preparation of the Reminder, other relevant methodological approaches, especially functional, systemic and symbolic-political, were also valued in order to develop a case study.

The Reminder therefore is an instrument for studying crisis management and leadership and consists of variables and indicators. Variable represents a narrow assembly composed of individual indicators. Indicators are analytical results for the various crises analysis such as natural and man-made disasters, military, technological, environmental and economic crisis, terrorist attacks and other crises. There are numerous crisis appearances and its consequences, and it is very difficult to formulate universal understanding of the crisis and crisis management and leadership. The scientific literature states that there are various crises and, with them the associated crisis management and leadership that have some common elements, such as vulnerability of the fundamental values of the entity to whom the crisis is addressed, limited time for decision making, uncertainty and stress of actors of the crisis management and leadership. The Reminder, in this sense, lists elements (degrees and indicators) that are common to most of the presented crisis.

The Reminder allows multistage studies of crisis and crisis management and leadership, and in particular:

1st degree: situating a single crisis in the historical, political, geographical and administrative system context;

2nd degree: establishing a time frame and a crisis description;

3rd degree: crisis partition into special situations or moments that require crisis decision;

4th degree: repeated overall crisis review with all its complexity, such as the use of a holistic approach.

Each level has more analytical terms, variables and indicators that represent analytical guidance during the particular crises research. An attention must be paid while trying to understand the indicators' general nature, so it is possible to provide the Reminder guide for analyzing of different crisis. It has to be clear that it is not possible, from the point of the set indicators, to study all potential crisis, as some crisis are simply not enough complex or the information availability will simply not allow it. On the other hand, some crises require further specific degradation of indicators, since every crisis, besides the general and common features, has its completely distinctive situational and contextual features.

In addition to the crisis management and crisis management and leadership division to different levels, analytical special topics decomposed to a number of variable and indicators can be established. These analytical themes include prevention and awareness of the crisis, the identification of actors of the crisis management and leadership, crisis perception, crisis management and decision-making process, political and organizational cooperation and conflict, crisis communication (collection and information processing, technical information systems, crisis communication with the public media and its role in crisis and crisis management and leadership), the crisis internationalization, the effects of the crisis time frame, the cost of the crisis, crisis management and leadership, as well as gaining experience and knowledge. The practical limit on the number of analytical issue is the crisis nature itself, researchers risk interest, the availability of data and the time available for the crisis analysis.

In addition to that, the Reminder with identified levels and analytical issues and with associated variables and indicators, primarily allows the *post festum* analysis (after the event) of the crisis and its management and leadership. To a certain extent, it was also possible to use it *in situ*, namely within the crisis itself. The analysis of crisis and crisis management and leadership by the Reminder allows the creation of report related to the specific crisis management and leadership, which together can form a national database of the examples of crisis management and leadership. Reminder is designed so that, on the basis of statements about various crises, it is possible to perform primarily qualitative (to a limited extent also quantitative) comparisons of content components (analytical levels, variables and indicators). Comparative analysis of this kind can further help in post-crisis knowledge achievement of crisis management and leadership institutions.

We know different methods of collecting and analyzing empirical data in order to make a case study of crisis management and leadership, therefore it is necessary to identify them first. During the analysis of the crisis and crisis management and leadership, a great number of primary and secondary sources appear, among which the most important are: official documents (meetings records, facts statements, diaries, testimonies, authorities findings, the official opinions, the analysis of the system actions, etc.), press releases, published technical analysis, technical and scientific articles,

newspaper articles and news releases on the Internet, in broadcast forms (TV, radio) and in print media. The analysis of the contents of these documents is the basis for the analysis of crisis management and leadership. Extremely useful method is interviewing the responsible actors of crisis management and leadership, which results should be used as a supplement in content analysis of documentary sources listed above. In this sense, it is necessary to highlight especially very useful group interviews with actors of the crisis management and leadership ("symposium story"), with which it is really possible to get a complete picture of the crisis extent, the crisis perception, relationship between the actors and so on.

Some actors in fact see only a partial picture of crisis management and leadership, so that their confrontation allows them to complement and sharpen the real picture. Descriptive and comparative methods are infallible in listing, describing and confronting events and processes, important from the point of crisis management and leadership. Significant method is also a secondary analysis of statistical data that are related to the crisis and its resolution. To fulfil the Reminder successfully, it is important that different methods of collecting data and information, their selection and usage, are in accordance with the analytical levels, subjects, variables and indicators.

Endemic nature of modern crisis is a part of the political and social context. The agreements will be more difficult to reach when it comes to identification, definition and assessment of the crisis and its consequences. Different crises may be the product of different critical paths. The old order is violated, and about the new one we have to negotiate. The assumption that the crisis is the first step toward a future of many alternatives, and that the point where we will arrive in the future depends, at least partly, on the response to the crisis, substantially raises the importance of crisis decision-making process. This requires a lot of political skill in order to transform crises and disasters form threats and accidents into an opportunity, and political advantage.

CONCLUSION

Public management in crisis and disaster management is becoming increasingly important and essential task of contemporary society. By the fact that it represents a serious threat to the structure of political or safety systems, which under the pressure of deadlines and complex security conditions require quick vital decisions, the management crisis involves the strategic knowledge, prediction and control of the uncertain situation at all levels. Technological revolution transformed the term of time and space, so that crises and conflicts adopt international character, while solving models include sophisticated integration and security services, and related systems. Cooperation becomes imperative, exchange of information and intelligence data requirement for success, while expenses of management must be transparent in order to ensure full public support.

In a liberal democracy, security services and its promoters must have control over the crisis development and the extent of the disaster, whether it was in the context of the political, legal or moral order. The methodology of crisis management requires entire and permanent engagement process, which with competence, knowledge and training guarantees the successful overcoming of the conflict. This means that success is guaranteed by the uniqueness of the team and its actions, while the leader has the role of a coordinator who oversees the development of all five strategic phases: identifying the crisis, making vital decisions, reducing uncertainty and good publicity to the public, prompt and successful completion of the crisis, and, bringing instruction as inheritance of planning and training for future crises!

Crises are a potential training ground for the reform of public policy, since every lessons learned from it serves to the future generations. The old way of controlling them in a time of technological and global transformation is no longer possible, while public policy can survive only if quickly breaks it or minimize its effects. Routines that were once the privilege of the security services are increasingly becoming levers in the hands of people who drive the media content and the capacity of public attention. The crisis management is therefore moving in the institutional structure overseeing crisis situation, and creating a strategy to overcome it. Crisis and disaster planning is a responsible and important process: the illusion is that they will disappear on their own - they have to be predicted, controlled and resolved!

REFERENCES

[1]. Babbie, E. (1995). The practice of social research (7th ed.). Belmont, CA: Wadsworth.

[2]. Boin, A., Hart, P., Stern, E. i Sandelijus, B.(2010): *Politika upravljanja krizama*, Belgrade: Gazette/Faculty of Security Studies, Faculty of Security Studies, Belgrade, 2010, p. 92.

[3]. Gottschalk, J. (2002), *Crisis management,* Oxford Capstone Publishing.

[4]. Hood, C.: "The Risk Game and the Blame Game", Government and Opposition, Vol. 37, No. 1, 2002, pp. 15–37.

[5]. Kešetović, Ž., (2008). *Krizni menadžment*, Belgrade: Faculty of Security Studies/Gazette.

[6]. Killitm, L.M. (1956). *An Introduction to Methodological Problems of Field Studies in Disasters*. Washington, D. C.: NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL.

[7]. Malešič, M., Prezelj, I., Kopač, E. i Groselj, K. (2004) "Opomnika za preučevanje krizneg upravljanja i vodenja" u Malešič, M. (ur.) *Krizno upravljanje in vodenje v Sloveniji izziv in priložnost*, Ljubljana: Fakulteta za družbene vede.

[8]. Milašinović, S., Kešetović, Ž., (2011) *Krizni menadžment u istorijskoj perspektivi*, Belgrade: The Academy of Criminalistic and Police Studies.

[9]. Mitroff, I. (2000) *Managing Crises before they happen*, New York: AMACOM.

[10]. Poper, K. (1973). *Logika naučnog otkrića*. Belgrade: Nolit.

[11]. Robert, B., and Lajtha, C. (2002). "A New Approach to Crisis Mangement", *Journal of Contingencies and Crisis Management*, Vol 10, No 4, 2002, pp. 181-191.

[12]. Ritchie, B.W. "Chaos, crises and disasters: a strategic approach to crisis management in the tourism industry", *Tourism Management* 25 (2004) 669–683.

[13]. Stallings, R.A., (2007). "Methodological Issues" in Rodríguez, H. Quarantelli, E.L., and Dynes, R.R. (eds) *Handbook of Disaster Research*, New York: Springer.

[14]. Seeger, M. W., Ulmer, R. R., Novak, J. M., Sellnowp, T.: (2005) "Post-crisis discourse and organizational change, failure and renewal", *Journal of Organizational Change Management*, Vol. 18 No. 1.

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ARCHIBALD REISS PROPAGANDA - COMMUNICATION INFLUENCE ON CONFLICT PARADIGM CONSTRUCTION

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Abstract: Analyzing the message content presented in the book "Hear Serbs" by Archibald Reiss, the authors research the importance and the role of social stability in conflict paradigms formation. Driven by Mc Dugal's idea and the *instinct theory* which determines the behavior of an individual and the whole social groups, Reiss interpreted human brain as the source of communication-political activities which character and will of and individual and nation gradually develop from. Pointing to great suffering, heroism and tolerance of Serbian people, also leisure and the complete absence of morality of selfish politicians and intellectual elite during the First World War and immediately after it, Reiss gave some advice how to preserve dignity and homeland. Relocating the propaganda discourse into symbolic level, he separated the return of Serbian people to traditional values- patriotism, courage, basic democracy, and hospitality, respect of human greatness, religion and mercy.

Connecting Archibald Reiss messages to present day situation, the authors prove the actuality of his attitudes and possible way of Serbian development. Spreading of latent, and then open antagonisms toward one collectivity gives power to national homogenization, institutional and systematic closing, so crisis perspective break out into the foreground, and also possibility of central social values breakdown.

Keywords: propaganda, communication, patriotism, awareness, conflict logy, democracy

International community, in interest of social theory from the aspect of security policy, is more and more battlefield, crisis and conflicts which by possible solutions and consequences open new problems, rivalry and contexts, with media catalytic elements. Numerous occurrences over which man has no control (natural disasters, ecological accidents, climate changes), and security processes which are product of human activities (social revolutions, social conflicts and dramas, biological wars, corruption, crime, terrorism….) are more often explained by media pictures. At the same time, conflict paradigms are based on quality, not on quantity of information, while management of propaganda spread networks and monitored information channels make important segment in national security strategy. Social problems are formed by public discourse forcing, while governing ideology encourages or slows down their intensity. Thus are marked people and nations who are laborious and useful, also those who are dangerous and incapable! First they are rewarded for their activities, later they are punished.[3]

Never in history has the world been so divided, and also directed to cooperation with each other, so poor, but at the same time rich, so aggressive, and also aware that only by pacifying may preserve the Planet from global cataclysm. Crisis management in rational and systematic way directs reaction flows on dangerous and destructive occurrences, when security services and organizations have specific responsibility: to react practically in the field at the same time having agreement of public and promotion of these activities! This work by analyzing Archibald Reiss writing gives new prospect of media constructing of conflict paradigm in crisis situations, with strong political reflection and national dichotomous agenda. Our aim is to present how the theory of social conflicts is adjusted to changes in civilization environment that is by combining of psychological matrix, of political loyal elite and security services practice in public sector is planed and directed. Appreciating the conflict logy as scientific discipline which in priority deals with peaceful means on crises

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solving, we want the image of contradictions in Serbia turn into the field of constructed narratives which lead to political, legal and moral improvement. The essence of modern conflict management is more and more in media prediction, control and social crises management that are their space[4]!

The structure of security estimation of social conflicts, as a part of strategic approach follows the dynamic and behavior of conflict parties. In spiky phases the communication is limited, conflict parties notice mainly things that separate them, distrust increases, and problem solving is not considered as a priority. It is insisted on differences, and in priority are historic, religious, ideological and similar exclusivities, while roots and all tradition connections are customized by pseudoscientific data. Hence it can be said that social conflicts are "basic social appearances both historical and actual constant of human community"[5].Whether this is international conflict, terrorist activity, prison riot or citizen protest crisis has its own dynamic, structure; limit and development, meaning that system may recognize it and in time successfully eliminate. The standard manifestation patterns allow identifying, explaining and forming construction models of conflict paradigm.

SERBIA AT THE TIME OF ARCHIBALD REISS

At the crossroads of Latin, Moslem and Slav world, confronted with turbulent and sometimes arrogant rush of industrial society, Serbia was, almost one century ago in front of historical, geopolitical, religious, communication and international challenges important for survival of the state itself, and also peace and stability in the wider surrounding. The Balkan area was almost impossible to define precisely, just as the population composition living there. Due to constant migrations and mixing South Slavs, Greek, Albanians, Turkish, Vlachs, Armenian, Jews, Aromanians, Italians and Roma tirelessly searched for their identity. At the same time, the interests of the powerful states were different: Russians via Balkan people planned to crash Turkish Empire, whereas Great Britain, with France and Austro- Hungary wanted to use it as the barrier from Moslem invasion. Five century Turkish occupation and frequent uprisings in the function of national liberation and perspective building of own community was natural tendency of deprived, oppressed and humiliated people. Patriarchal social structure reclined on fragile, slow and undeveloped forms of public communication[6] while mass culture first outgrowths formed on epic, aesthetic forms, often distanced from historical facts. Fiddle and folk stories formed national spiritual space[7] that was, thanks to Vuk Karadzic admired by European romanticists of that time led by Kopitar and Grimm brothers. The myth on national golden time was spread, Kosovo oath by which heroic death was better than any kind of slavery form, and by which mobilizing of inner forces and directing them against enemy was tendency.

The moment of deadly shot on Duke Franz Ferdinand (28. Jun, 1914) by Gavrilo Princip had decisive moment on myth strengthening of great Serbian hegemonic tendencies. Members of national revolutionists gathered in organization "Mlada Bosna" was not only Serbs but Moslems and Croatians of all ages and education, decisive in intention to create new Yugoslav community. In media reports the guilt was transferred on only one side, so that only Serbia was burdened by responsibility and blame. Even then, information was filtered, mitigated, crooked, formed as weapon in the battle for public support. The history flow was noticeably changed while Serbs were attributed of violent character and irrational aggression. Public opinion was unified by uniform reports which in the most extreme forms propagated meaningless claims on violent nation who starts new, invasive wars. Astute designers of geopolitical movements knew well that stereotypes on one nation are stronger if there is a sense of guilt in them. The attacked side is always passive, in the position of constant defense and negation, which is in crisis situations good for imposing the climate of social tension. The thirst of Austrian, German and Vatican press was satisfied by fabrication of a stereo-

4 Jevtovic.Z, *Political Spectacle and Public Opinion*, CM Faculty of Political science, Belgrade and protocol, Novi Sad, No. 7 , year III, summer, 2008, pg.5

5 Milasinovic,S.,Kesetovic,Z.m(2009):Crisis Management, KPA, Belgrade, pg 201

6 German historians in XVII century left data that from Belgrade to Nis was travelled even for eight days. The post and similar notes were carried by special services composed of "Tatars", fast horsemen who, for example, from Belgrade to Constantinople on 17 stations and mezzulans changed animals so as to with little sleep cross it for 183 hours (Bjelica, M., Jevtovic., Z., 2006: 2013-2014)

7 "People are patriotic. I do not know any people where legendary national heroes live so long in the spirit but you" (Reiss,A.,2005:3)

type on "barbarians", "destroyer of peace" and their "extremist leadership"[8], while at the same time the content of the ultimatum offered to Serbian Government was concealed. Manipulation mills grinded each and every thought on having a chance for peace, encouraging the archaic feelings of national hatred, with the aim of demonizing the whole of nation. In the heads of ordinary people all around the Continent the image of assassin skillfully was identified with the ethnicity he belonged to, getting the form of battle against evil, civilization and prosperity. Meticulously woven knit of lies, manipulation, rumors and disinformation covered the reality offering manipulation surrogate in the function of Austro-Hungary and German propaganda machinery, slowly pushing off Serbia from Europe. Adolescent and half educated Serbian political elites did not perceive the importance of battle for the planetary public opinion. Running away from Habsburg- German embrace, they, supported by English, French and Russian allies, hurried towards formulating the strategy of Yugoslav, shortsightedly recognizing in it the solution for caring the Serbian population scattered on wide area (from Macedonia, over Kosovo and Metohija, Montenegro, Dalmatia to Posavina and Lika).

Rodolphe Archibald Reiss (Ger. *Rudolph Archibald Reiss*), distinguished Switzerland publicist, doctor and professor of chemistry at the University of Lausanne[9] truly was delighted by the patriarchal image of life he saw in Serbia, but disappointed by separations among ruling elite and weaknesses he saw everywhere. As main Serbian people virtues he noticed courage, patriotism, religiousness, hospitality and democracy, charity, pride and brightness. He was charmed by moral and heroic characteristics of Serbian peasants and solders he found in the First World War. He thought that these virtues should be the foundation of liberated Serbia thus saying: "People are courageous, and that courage often reaches heroism. I can rightfully say that because I saw your solders, and they were nothing but the people itself, in almost all battles of the great liberating war (Reiss, A., 2005:3)".

Invited by Serbian Government, he came to Serbia in 1914 as a neutral observer to investigate numerous crimes of Austro-Hungarian, German and Bulgarian armies over civilians. Even then propaganda lies about Serbian people were spread, presenting it in European press as "savage, predatory and criminal". With Serbian army, Reiss walked over Albania, Salonika Front and with Morava Division marched in liberated Belgrade in November 1918. and then in Geneva deported and organized care and education for 300 war orphans. After the War he was engaged in the Ministry of Foreign affairs, Department for Documentation of War Crimes and Ministry of Internal Affairs where he founded two year police school. He modernized technical police in the Ministry of Internal Affairs of the new state[10]. In after War period he was very much offended by Serbian politicians and "intellectuals". He confronted the members of the Governments, first of all with the Prime Minister Nikola Pasic. He criticized the authority behavior towards former warriors and war invalids, thus being disappointed by phenomena in the social and political life he withdrew from all public functions.

On what he saw, experienced and heard, Reiss wrote several books. Among most important were: "Letters to the Serbian- Macedonian front" (1916-1918) and war diary- "What I saw and Suffered in the Great Day" (1928), but he became immortal by his legacy to Serbian people, unpublished handwriting of the book "Hera Serbs" (in original "*Ecoutes les Serbes*!") which was completed on 1st Jun,1928. He published reports in magazine Gazette, in neutral Switzerland trying to counteract strong anti Serbian propaganda. He wanted archaic and patriarchal political community[11], the way depleted, destructed, burned and looted Serbia was, to get into brotherhood of European families as fast as possible by researching domestic patterns of psychological behavior and character in conflict situations but in peace phases as well. The psychological approach to conflict theory at that time had many representatives (W. McDougall, W. James, S. Freud and K. Lorenz), because he researched social conflicts as appearances coming from psychic personality structure, that is from genetic and acquired aptitude of people to differently experience social reality and to behave in it differently. As an excellent criminologist and analyst of different social violence forms and destructions, Archibald Reiss had to know the *theory of instincts*, because their combination could explain all security appearances. Instincts, according to William McDougall, not only determine individual behavior but also are important for social groups acting and thus:" human brain has inborn or

8 Corovic, V.,: *Relations between Serbia and Austro-Hungary in XX Century, Kultura, Belgrade, 1936, pgs 141-183*

9 Archibald Reiss (1875-1929) was the founder of the first academic program of forensic science and Institute of Criminology at the University in Lausanne.

10 His criminal technique of that time, according to the opinion of American researchers travelling along Europe with the aim to research this kind of police activity, was at the very high level.

11 This term means " wider group which share certain set of values, have the same or similar way of life, identify themselves with the group and its practice and mutually acknowledge each other" (according Sladacek, 2008:11)

inherited tendencies, important source of each thought and action, whether individual or collective, presenting the basis out of which gradually are developed character and will of an individual and nations under the leadership of intellectual abilities."[12] The roots of understanding which in the basis of human activities put different instincts are connected, first of all to Cartesian conception of motivation, [13]and then their renaissance was with the Charles Darwin evolution theory. Studying in detail the character of Serbian people, Archibald Reiss pointed to its virtues and weaknesses, interests and diligence but also to its multi- causal nature specially expressed in crisis and conflicts.

CONFLICT PARADIGM CONSTRUCTION

Intervening in interest zones of great powers, Serbian people at the beginning of XIX century found itself lonely at the world crossroads, sealed as destructive, disturbing and disobedient. Victim in blood spilled in the name of European values and democratic heritage produced destructive consequences, for physical destruction of population (about four millions killed and hurt during the First World War) lead the present state in danger of biological disappearance?[14] In the core of national upbringing there was patriotic enthusiasm, myth of self- sacrifice because of sublime national goals, cult of humanity and bravery, epic of suffering for broader social ideals. Poverty and industrial backwardness were considered as an act of natural order, and outlines of European surrounding were visible to only few intellectuals educated in Paris, Vienna or Pest. National orientation for national ideas symbolized sublime ethic principles, morality and respect, acting on cognitive and emotional level of average uneducated inhabitant. The crisis demands extensive monitoring and reporting to public, what in this case due to low level public education was not possible. The crisis consequences then grow fast into moral drama, whereby leaders take over rudder of changes, calming down the situation and designing safety frame. Serbia in these fateful days had no powerful social elite, with firm value judgment or national criteria.

From that time the characteristics of idealizing, crooking and mystification of reality are noticeable, what will later largely be used in propaganda wars. The leaders have the greatest responsibility in crisis management: they talk on hampering, mitigating, decision making in crisis phases and return of the community into stability. Thereat, it is important the institutional context which expects from authority to inform citizens, thus preventing the distribution of misinformation, rumors, gossips and fabrications. Elite in stress situations reduce the independence offering authoritative explanation of what happens, what is imperiled and what can be done? Archibald Reiss wrote that during the First World War Serbian "intelligence" was not engaged enough, the great part was safe abroad, and apart from not taking part in the War they did not try to help in propaganda work either. Upon end of the conflict they returned to liberated Serbia, with intention to manage all more important jobs, and with the aim of personal enrichment: *"Politicians have corrupted the country… They are powerful here with you…Politics interferes in everything and manages all…Officials are without moral, without honor, personal interest is first…When they become ministers, your politicians become so arrogant that it is almost ridiculous…. Officials are, by the rules of the worst quality…They make their occupation using your aptitude for party politics, and you have professional politicians who earn living on this…Oh what I am saying- they amass wealth…"(Reiss, A., 2005:37-40)*

Reiss interpreted social conflicts through psychological personality character, tension, aggression and frustration, and he did not neglect other psychological processes and characteristics such as intelligence, specific motivations, characteristics of the temper, relevant attitudes, morality, thinking process and other categories. He knew well that in time of political and economic crisis the feeling of

12 McDougall, William (1960. First published 1908), *An Introduction to Social Psychology* (23rd ed.), University Paperbacks. Imprint of Methuen & Co (London) and Barnes & Noble (New York).

13 René Descartes, 1596-1650 is considered to be the founder of *rational theory of motivation*. He started from dualistic cognition of relations between soul and body: the body is a kind of mechanical machine, while soul was given to man by God. Thus the difference between people and animals is in that animals are governed by instincts while humans, considering they have soul, are not beings governed by instincts but also by mind allowing understanding and prediction of own actions. So the man may behave: either rational (when he is a real man) or irrational, when he gives over to his instincts and reacts similarly to animal.

14 Serbia is the fourth in the world for people older than 65 years! The average citizen is 41, 3 years, except Municipality of Bujanovac, Presevo, Tutin and Novi Pazar, number of dead greatly outstand the number of born, and thus the white plaque threatens seriously causing geopolitical consequences as well. Non Serbian population has positive increment in difference from Serbs who dramatically disappear! For example, the average age in Vladicin han is 60, and in nearby Presevo is only 21. On Kosovo and Metohija the average age is 23, 5. Anticipating strategy and perspective….

inability, fear, violence and distrust in state authority whose task is to provide peace and safety. This is the key target of enemy: to provoke the reaction of attacked party by violence actions, and then by media hullaballoo turns attract attention of the general public. The patriarchal model of living, illiteracy and poverty, with communication isolation and conservative apprehension that truth does not require propaganda, feeble Serbian country pushed away from power centers, and the awareness of this reached slowly. When once crisis is manifested, leaders have to take actions to forestall consequences, which means that it is no good waiting them develop but react on first signals that it is coming! Political elite should recognize threats, events and processes that anticipate crisis reality. Lateness means hard value concessions and great political risks.[15]" *Serbian people*", as Reiss estimated, *"have moral characteristics that overcome moral characteristics of other people"* but " *ruling class works on destruction of these moral virtues giving them bad example"*(Reiss, A., 2005:27). Ljubinko Milosavljevic, in the analysis of Reiss's legacy to Serbian people perceived ingratitude as a great flaw, which is expressed in a paradoxical way; as a friendship relation to enemies, and unfriendly to friends (Milosavljevic, Lj. 2012:80).

Pointing to great suffering, heroism and tolerance of Serbian people, and short-comings like inaction, and total absence of selfish politicians and intellectual elite moral, Reiss gave a lot of of practical advice how to keep dignity and motherland. The purpose of this list was to draw attention of Serbian intellectuals, politicians and state officials to many negative apparitions that came out in post war life, especially in state policy – which had devastating impact on total development of people and state of Serbs, Croatians and Slovenians. As expert analyst and attentive observer, he by Manichean techniques decided to perform psychological characterization of Serbian nation. The polarization was the easiest to do by dividing upon dualist pattern: *black – white; patriot – traitor, nationalist- chauvinist* and similar. In conflict situations, press easily project the profiles of leaders, pointing and glorifying certain virtues at the same time abetting opposite meaning for opponents. Propaganda model is based on principles of primitive tribe condemnation (punishment) and approval (reward), meaning that roots may be looked for in archaic, mythic times when cowards and sissies were publicly sealed in difference from heroes and braves who were the carriers of moral meaning. Pagan mentality is only inwrought in war Balkan reports, so that by creation of images on some persons' characters or even the whole of administration, propaganda network knitted. In communication theory the production of "heroes" and "*traitors*" present verified and effective socio – psychological instrument of public seduction, which under the influence of political and media qualifications seals the target of champagne independently of real actions.

Reiss pointed openly and sharply to growing rooting of negative appearances, first of all corruption, lightheadedness and inactivity in state administration and judiciary, and in one part of Serbian intelligence ready to do every kind of compromise for own beneficiation. He did not attribute this to negative essence of people's character but after war circumstances which caused demoralization of generations tired of war and negative influences – credits coming from West and East of Europe. As a great problem in politics he pointed to need of party connecting, whereas politicians express combativeness through partisanship, neglecting the interests of the state. He considered immoral the fact that in congress were war profiteers and not heroes who waged war. Irrationality and emotion in crisis situations produced devastating consequences on later community development, but this was not taken care of. He warned Serbs on this appearances, which might not only compromise the presentation on size (imposed) of war for liberated and united national sate, but also – with the strong foreign subversive influence – endanger the basis of free state existence and Serbia democratic society, mostly composed of (honorable and patriotic) peasants. Moving propaganda discourse into symbolic plane, he separated the return of Serbian people to traditional values – patriotism, heroism, and basic democracy, and hospitality, respect of human greatness, religion and charity. According to this, the basic cause of aggression, violence and conflict between individuals and groups is deep in human nature, that is in unconquerable instinct of aggression[16].Social conflicts mean numerous forms of mental manipulation, but in order to produce desired effects it is necessary to know well the psychological structure of people as the object of campaign.

15 Brecher, M.: *Decisions in Crisis: Israel's choices 1967 and 1973*, Berkeley: University of California Press. 1980:115.

16 "Crisis causes and increases separations not only within and between (segments) society and administration but also between officers, groups and organizations within government. One of the most obvious gaps is one between operative units, their chiefs in headquarters and their political or bureaucratic bosses on the top of governing hierarchy"(Boni et all, 2010:103)

CONCLUDING REMARKS

Almost a century after Archibald Reiss's stay in this place, it may be concluded that little has changed in political – security context of Serbia and Balkan surrounding. Politics of crisis management is still on improvisation, instinctual theory is still deeply embedded in minds of the population, while political elite are engaged on their own enrichment, rarely on state interests. Different needs: economical, class, ethnic, military, religious, political , socio – psychological, together with numerous contradictions, interests and aims in security frame threaten the level increase of the within group and between group tension, intolerance and hatred, while peace is kept by tricky political settlements. However, the technology significantly fastened the information transfer (computers, internet, social networks), opening the communication space to Trans national and international organization of enemy networks. Security science among determinations of modern conflicts points to *lethality* (change of tactics which once attracted public by spectacular murders of prominent persons into ritual actions with great number of casualties); greater *coordination* of conspiratorial forces, usually supported by powerful intelligence services or sponsored by some state centers, and greater use of the *soft power* tools (media become fastest and most efficient promotion way of certain activities, providing international legitimacy by acting in the field). Symbols of modern state instead from outside are, more often, attacked inside and besides traditional motives (terroristic, separatist, religious, subversive, economic, rebellious) there is cybernetic, demonstrative and ecological (green) motive. The expression forms are most obvious in communication –propaganda models, so that in global space there is invisible and unrevealed battle for public influence that is power expending of global mass media centers and networks. The art of governing is not any more in power demonstrating or armed forces, but in quiet imposing of dominant beliefs and opinions, defining the meaning of terms, processes and personalities in their environment.

Archibald Reiss in detail revealed all shortcomings of Serbian politicians and "intelligence" of that time, but it is obvious that there is continuity with the present. As the wheel of history in this area stopped! Regime revolved, from communist, socialist, democrat to recent generation of neoliberal illusionists, but in Serbian elite almost nothing has changed. New- old Serbian elite formed on principle of "compassion" (explained by Valfredo Pareto – inconsiderate use of power and cunning), *in chaotic and illegal or half legal situations which they themselves created and maintained by the help of authoritarian rule mechanism, sheltered for nation, but deep in corruption and completely coalesced with the organized crime.*[17]

Governments, at least those democratic ones, cannot allow living too long in crisis, for such state influences internal disintegration, and slows down the integration of the state into international flows and institutions. Coming to political and organizational advice, they should preserve crisis as a part of collective memory, doctrine to future generations. In modern society it is important to have quality analysis of information wealth which is at every moment at our disposal, because of the security services success to change numbers, images and data into useful analysis depend their duration. Strategic change is in creating of fast and reliable estimations of actual problem, which thanks to internet, mobile telephones, cameras and computers enables better planning, informing and centers of power reacting. Technology destructively transforms traditional forms of public, each aspect of life and each aspect of society. In public arena the aim becomes imposing of society problems agenda[18], priorities and ways of solving. Greater number of organizations included in crisis solving extends its duration! Many people should agree with the status of the problem itself, more has to happen to come to conflict from crisis. Events have to be interpreted by values and characteristics, whereby psychological dimensions should be downloaded as a part of dynamic mental map on which is possible and has to act on. Rooted behavior patterns are slowly changed, while leaning on historical analogies may be the trap with huge consequences. Crisis and conflicts may look similar, but in practice they are unique and specific in their own ways. Long lasting crisis may be the chance for politics and state institutions reform, and in Serbia this is the actual moment.

17 Aracki, Z., (2009) *Forming and characteristics of Serbian media elite in years of transition*, Thematic collection:"Balkan in Process of Euro-integration – 20 year of transition" University in Nis, faculty of Philosophy and center for sociological research Nis, pgs 207-2019

18 *Log of work*, author notification

European Union makes new continental union which members do not define the influence only by their past and their own geopolitics, but by their place in the world of security changes. Historical and modern experience show that it is not real to expect that social conflicts are solved by themselves, meaning that without help of others Serbia is fertile ground for conflicts.

LITERATURE

[1]. Aracki, Z., (2009) *Forming and characteristics of Serbian media elite in years of transition*, Thematic collection:"Balkan in Process of Euro-integration – 20 year of transition" University in Nis, faculty of Philosophy and center for sociological research Nis.

[2]. Brecher, M.(1980): *Decisions in Crisis: Israel's choices 1967 and 1973*, Berkeley: University of California Press.

[3]. Bjelica, M and Jevtovic, Z. (2006): *History of Journalism,* Megatrend, Belgrade.

[4]. Boni, a, hart, P, Stern, e. And Sandelius, B (2010) *The Policy of Crisis Management*, Official Gazette , Belgrade.

[5]. Jevtovic,Z. (2008): *Political spectacle and Public Opinion*, CM, No.7,year III, faculty of Political Science, Belgrade and protocol, Novi Sad.

[6]. Milasinovic,S., Kestenovic, Z., (2009) *Crisi Management*, KPA, Belgrade

[7]. Milosavljevic, Lj. (2012): *Archibald Reiss and Slobodan Jevtovic on National Serbian Caharcter*, Collection: Other on serbs, Serbs on others, Facutly of Philosophy University in Nis, Nis.

[8]. Reiss, A. (2005): *Hear Serbs! Beware of yourself*, Serbian economy and cultural Club, Belgrade.

[9]. Sladacek,M. (2008): *Political Community*, Institute for Philosophy and Social theory, I.P. Filip Visnjic, Belgrade

[10]. Corovic, V.,: *Relations between Serbia and Austro-Hungary in XX Century, Kultura, Belgrad.*

[11]. Michel Foucaut: *Discipline and Punish*, Informer, Zagreb

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THE CREATION OF THE EFFECTIVE BUSINESS SECURITY SYSTEM AS THE IMPORTANT PART OF NATIONAL SECURITY

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Abstract: The globalization processes and world economic crisis significantly increased an amount and the character of the threats and dangers, elucidated the imperfection and weakness of the economic security system of the market participants of the domestic business, as well as the international business. The creation of the complex enterprise security system and improvement of the security infrastructure in order to protect the market participants from the internal and external threats at the micro and macro levels is the guarantee of the stable business development. Thus, the security is the science, which should be investigated and developed as art, which one should posses; it is a corporate culture, which should be taught and learnt by a person and society. Hence, the creation of the effective enterprise security system, as the important component of the national security, requires the investigation and consideration of the best empirical experience of the advanced countries of the world, including the examination of the committed errors in this sphere by the other countries and their consequences.

Keywords: globalization processes, economic crisis, international business, new paradigm, business development, national security.

The globalization processes and world economic crisis have substantially increased an amount and character of threats and dangers proving the imperfection and weakness of the economic security system of the native as well as international business entities. The contradictions in different spheres of human activity in an international economy as well as in Ukraine have been recently sharpened: the disparities of countries economic development levels have increased, shadow processes have intensified, international competition and dishonest competition have been practised on a large scale, the risks of credit-financial operations have raised, raider attacks have become more common the same as corruption, organized economic crime etc.

Dialectical combination of the globalization of the world economy with simultaneous strengthening of the regional factor influence on the world economy and policy is forcing the society, researchers and practical workers to find adequate answers for new challenges and threats, expose in good time, prevent and neutralize the real and potential threats, look for the ways to solve the problem questions.

The world financial and industrial structures pay considerable attention to the determination of the influence of crime on the development and functioning of business in countries worldwide. In fact, the business sector is one of the most attractive objects where malefactors demonstrate outstanding ingenuity skilfully using legal gaps, defects and omissions of supervision and control organs. They are constantly improving mechanisms, methods of preparation, commitment and concealment of crimes. Their actions predetermine the high latency level [1. p.42].

The effective development of any country's economy largely depends on the level of its economic security. In particular, it is the only condition that makes possible to conduct the independent foreign and internal policy that meets the national interests.

We should agree with the opinion of those experts who consider the following aspects the primary national interests, i.e.: provision of stable economic development policy and innovative development; provision of national economy competitiveness; internal market development; support of national manufacturer; reduction of the "shadow" economy level and corruption; rationalization of the national economy structure [5, p. 43–57].

Thus, the realization of national economic interests is carried out due to the economic development and resistance to the threats taking place in the system of economic relations. Therefore, the economic security is one of the constituent parts of national security. In particular, the essence of economic security makes the basis of national security. At the same time it is a relatively inde-

pendent system which has its individual structure, organizational-economic mechanism, internal development and functioning logics, facilities of influence on all other aspects of safe existence of personality, society and state [6, p. 7]. Simultaneously, it should be noted that in the current legislation of Ukraine the concept of "the state economic security" or "national economic security" is not precisely determined. Therefore, it generates vagueness in the actions of the state administrative machine and results in errors at forming of the economic development both of the country on the whole and its regions [6, p. 34].

The proper level of the economic business security is the pledge of steady development, especially in the conditions of acceleration of the processes of the integration of Ukraine into international economic organizations.

The problems of business security have been investigated by the following Ukrainian and foreign researchers: V. Andriichuk, L. Abalkina, V. Abramova, O. Baranovskiy, V. Bohomolova, Z. Varnalii, O. Vlasiuk, V. Vorotin, V. Heiets, A. Kachynskyi, T. Kliebanova, T. Kovalchuk, B. Kravchenko, P. Krainiev, V. Kuzmenko, I. Mazur, A. Melnyk, A. Mokii, V. Muntiian, A, Sukhorukov, L. Fedulova, V. Franchuk, Ye. Khlobystov, T. Khailova, V. Shlemko and others. The problems of efficiency and the system management of the companies competitiveness were investigated by: V. Aponii, H. Bashnianyn, I. Blank, T. Vasyltsyv, I. Dolzhanskyi, I. Kopych, S. Mochernyi, V. Nemtsov, I. Markina, B. Miziuk, S. Pokropyvnyi, Yu. Polunieiev, and Z. Shershniova.

However, in spite of the significant work of scientists, there is an objective necessity to construct the effective business security system on the principles of normatively-legislative, methodical and financially-organizational support taking into account all aspects of the institutional, public, state and legal adjusting of the business development.

The requirement in strengthening of business economic security takes the special significance in the conditions of the market economic system, as it is included into a list of vitally important elements of the effective functioning of the social and economic society system, its management mechanism, provision of its defence and development.

It is necessary to admit that in the conditions of world economy globalization and joining the international integration associations, a higher level of the state economic security is being objectively formed. The security of state economic interests within its limits is determined by the level of national economic development, products competitiveness and participation in world economy.

The business economic security plays a determinant role in strengthening the state national security and is a pre-condition of its steady development.

We will agree with the opinion of those authors who under the state economic security (national economic security) understand a state of the national economic system within the limit values and its ability (including due to its self-sufficiency and stability) to resist to the threats creating necessary terms and conditions for realization of national economic interests to development of economy with the aim of providing the integrity of economic system processes.

As it follows from the mentioned above, the role of economic security in the national security system is a determinant one. That is why the most threats are directed against it.

The analysis of the interpretations of the "business economic security" concept described in literary sources affirms that they have different initial positions.

Firstly, the security is a necessity and an interest. In the real life it is impossible to find any situation in which there is no danger in relation to any subject [7, p. 13]. It is the security that is a reaction against danger, and it is required only when there is a danger [8, p. 51] or threat.

A necessity in security is the primary necessity of every person. It is realized at the individual, collective and public levels. The feeling of security is a subjective perception of threats to own existence. Proceeding from such understating, a person has the opportunity to modify his behaviour, i.e. to show certain interest which stimulates and directs his activity to satisfy this necessity. Thus, the necessity in security is identical for all people, but the interest can be different. At the same time, it is necessary to note that the feeling of security can create an illusion and not represent the actual state of affairs. There are cases when attention is not paid to some threats, or vice versa they are perceived in the sharpened form. In such cases the necessity in security is displayed through a specific inter-

est which is the basic reason for people's behaviour in relation to the realization of this interest, and consequently to the realization of this necessity.

Secondly, security is determined by the corresponding state of the socio-economic system. In particular, security is the state with no danger [9, p. 47], or security is such state of protection of vitally important economic interests from the internal and external sources of danger. The concept "the state of security" represents on the one hand the final results of the security function implementation, and on the other hand - an aim of organization. In other words, security is firstly the aim of the system at which it is aiming and secondly, it is the state which depends on the efficiency of its activity results. The most general criteria of the state of social systems are "their integrity and development".

Thus, the state of economic security of the business activity can be defined through corresponding criteria and indices (indicators). On the one hand, they signal the area of security, and on the other hand, the development of threat as a result of threat realization. The safe state of the business system is when its basic criteria are within the limit values, i.e. there are still possibilities for development.

Thirdly, security is examined as a property of the system. The existence of any system provides its security from destructive influences. All systems counteract their destruction [10, p. 104]. For this purpose the system has such characteristics as inwardly mounted structural elements, due to which it is able to counteract to the threats that are worsening its state and violating the set order of functioning and integrity.

In the biological systems these are immune properties of organism, and in socio-economic ones these are stability and self-sufficiency of the system.

Fourthly, security is understood as a specific activity, process and function of the system aimed at defence of personality, society, or companies from different threats in the systems of corresponding level. Security as a function or activity is revealed for the researcher through an exposure, warning, weakening, removal and reflection of danger and threats able to inflict substantial losses, close a way for progressive development, or system ability to resist to the threat of losses origin. Thus, it should be remembered that it must be a systematic task directed toward the support of the sufficient parameters of vital functions of the system.

Fifthly, security is understood as a complex concept: economic security is a specific state and degree of security of any subject and its ability to resist the changes of terms of existence [11, p. 10]. Or it is the state and ability of the economic system to resist the danger of breakage of its organizational structure and status, and also the obstacles of development aims achievement.

Sixthly, security in a wider sense is a philosophy of modern management, a value and a constituent part of corporate culture. The essence of such security perception is to learn to manage the socio-economic systems in the light of security, to understand it as a function of life and vital functions of a man and its primary necessity [17, p.25]. Under such an approach the security is realized in individual and public consciousness in the form of spiritual value; in this connection it has universal character and recognition. Presently, there is a tendency to perceive security as valued norms of corporate culture; this process is especially encouraged in the leading world corporations. The following values are characteristic for such corporations: security, health of employees, high ethical requirements to doing business, attention to the worker as to the man and main values of company and society. The perception of security as the valued norms of corporate culture is for the Ukrainian companies a difficult process which requires the adjusted work of state institutes as well as management of the business entities.

Next, the security in the modern world is examined as science and art. Presently, there is a need for people, especially leaders, knowledgeable about counteraction to the threats, methods of provision the integrity of processes consisting in organization as well as maintenance of company as a structure and own business, and able to make conditions to its development. As a reaction to this necessity, a special branch of scientific knowledge was established and developed - Securitology (from Greek - "knowledge" and English – "security"), in Ukraine - "bezpekoznavstvo". The development of security as science facilitates forming of modern knowledge and abilities of Securitology in the business sphere. Thus, security is a complex concept which has different external displays, i.e. external structure which in a diagram form is presented in Fig. 1.1.

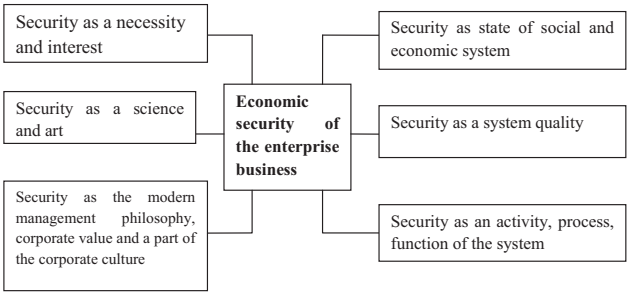


Fig. 1.1. External structural elements of economic security as categories (Source [17])

Stability of economy represents strength and reliability of its elements, ability to maintain the internal and external loadings. The more stable economic system, the more flourishing economy, and consequently, the estimation of its security will be higher. The violation of proportions and connections between different components of the system results in its destabilization and is the signal of transition of economy from the safe state to the dangerous one [12]. V. T. Shlemko and I. F. Binko consider the following as such elements:

– economic independence which means first of all possibility of realization of state control on national resources, possibility to use national competitive advantages for provision of the equal participation in international trade;
– firmness and stability of national economy which provides for suppression of destabilizing factors;
– ability to self development and progress, i.e. possibility to independently realize and protect national economic interests, carry out permanent modernisation of production, effective investment and innovative policy, develop intellectual and labour potentials of the country [13, p. 6]. A number of researchers consider the following elements the main structural elements of economic security: economic independence, economic stability and economic extended recreation [12]. O.S. Vlasniuk is of the similar opinion. He refers to such elements as self-sufficiency, firmness and development to the structural elements of economic security [14, p. 40]. The approach of G. A. Minaiev is totally opposite. He bases his opinion on development and security as the major functions of the vital activity of the socio-economic system. These are interconnected sides of one process being simultaneously dialectically opposite. Each of them has it own methods and means of support. Development is a primary function, and security is a secondary one. Its aim is to provide development by counteraction to the threats. However, the secondary character does not diminish its role as any human activity seems to be devoid of sense without security [16, p. 41-48].

Thus, we may distinguish two approaches to the essence and maintenance of the category of "security". According to the first approach, security includes a number of elements, and development is among them. By means of such elements the security is displayed and the system property (as its function) and it is a basis of vital functions of the socio-economic system. Under such approach any activity can be examined as a constituent part for provision of economic security, for example, investment activity and detection of economic crimes. The first one is aimed at increasing production, strengthening integrity of the economic system etc., i.e. it is intended for satisfaction of the state or company economic interests, and the other one - vice versa, it endangers these interests. Thus, the process of economic security provision includes two fundamentally different subjects of activity impossible to be combined. In addition, economic security in scientific researches is acknowledged as science which is distinguished in separate branch. Consequently, it has its own subject of research.

The second approach foresees the practical equality of development and security functions in the vital activity of the socio-economic system. However, the author of this approach have not related the underlying structure of these concepts, but economic security as an activity and as a scientific field which has its own subject of research.

When forming the conceptual principles of organization of the business economic security system the clear understanding of the internal structure of "development" and "security" concepts is needed. If economy does not develop, then it sharply looses the possibility to survive and adapt to the internal and external threats.

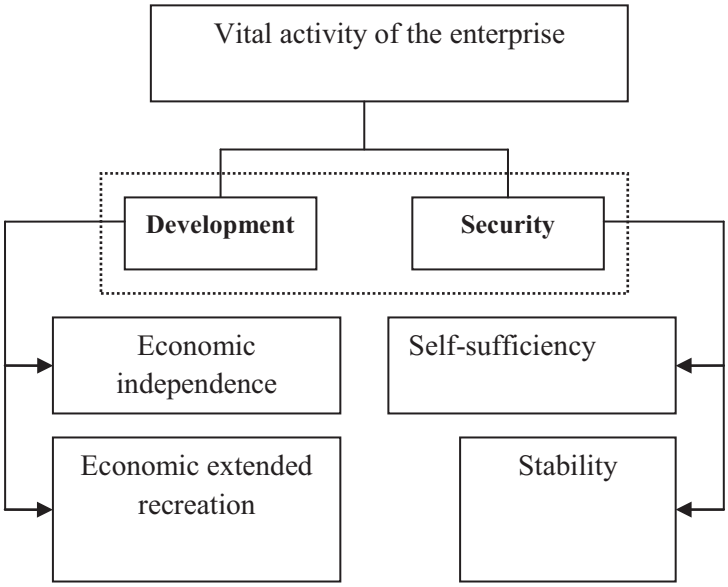


Fig. 1.2. Internal structure of "development" and "security" concepts. (Source[18])

Basic structural elements which the most precisely expose the essence and content of the "development" and "security" definitions are the following:

1) Functions of development:

a) economic independence (presence of maximally necessary resources and possibilities which allow a proprietor or management subject to be equal in the rights in business relationships);

b) the economic extended recreation (presence of maximally necessary quantitative and qualitative transformations on the basis of investments and innovations which provide realization of economic interests).

2) Functions of economic security:

a) self-sufficiency (presence of necessary resources and possibilities of their application at least at a level that is sufficient to provide the development function realization);

b) stability (presence of necessary conditions, guarantees and system connections between elements at least at a level that is sufficient to provide the development function realization).

Thus, the development involves qualitative as well as quantitative maximally optimal indices, and economic security requires minimum needed indices – only then the economy could be developed. Just the same approach is applied to the development of indicators of economic security of Ukraine which clearly differentiate the economic security and danger. In other words, if the economic system of a country is within the limits of maximum values set by the state, then its state is determined as safe and vice versa [11].

Summing up the consideration of "economic security" concept, the attention should be paid to the fact that economic security as a phenomenon is revealed through internal and external elements structurally represented in Fig. 1.3., as a single integral process being in dialectical intercommunication.

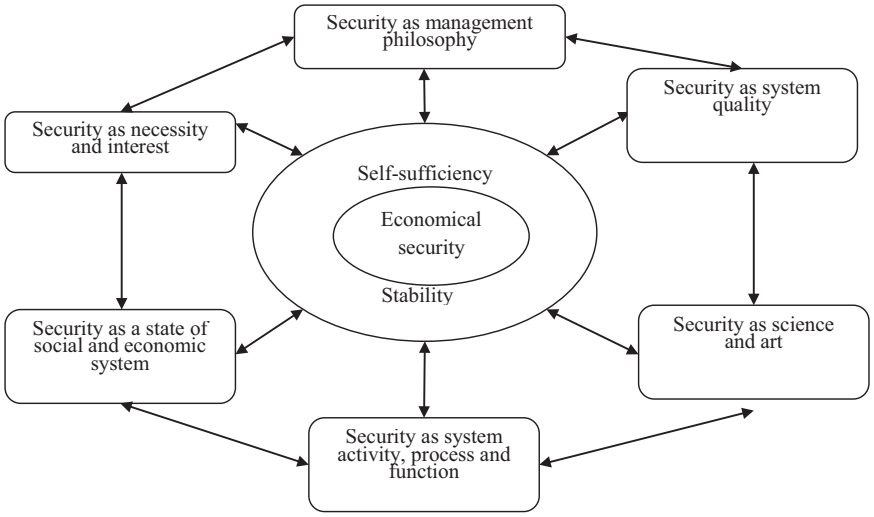


Fig. 1.3. Internal and external elements of "security" concept structure (Source[18])

Thus, security is a need of the system in the security of functioning, the state of the system, its characteristics as well as a specific activity of its structural elements aimed at counteraction to the threats. Moreover, it is also a way of the administrative thinking and constituent of corporate culture, and also science and art simultaneously. From the point of view of a systemic approach, all these concepts are interconnected and form a single unit. The safe state of the system and security as its property (quality) are the result of management (in the light of security) and formation of corporate culture and implementation of specific functions of economic security such as: protection, realization of detective activity etc. In turn, their efficiency depends on the quality of the security system (level of training of specialists as well as of technical, regulatory and legal and other provision) and state of the socio-economic system, primarily of the economic one. In complex it generates new quality of the economic system - its self-sufficiency and firmness. Consequently, on the basis of these elements it generates the ability to prevent and stop the action of threats (to counteract) on the one hand, and on the other hand, due to it – to create necessary conditions for realization of corporate economic interests and rights as well as realization of development function and provision of the integrity of processes, objects and on the whole of the business system. This is exactly what makes the basic content of security and the activity subject of the security subject.

Thus, efficiency of the security function of the business structures depends not only on own possibilities but also on the state influence.

The state as universal and sovereign political organization as well as all its mechanisms, laws, and bylaws have immediate relation to economic security [17].

The state is a prime cause of changes of the businessmen economic behaviour. Moreover, it is the external environment of company functioning. It should be noted that the external environment is characterized by rapid, often multi-vector and contradictory changeability. Instability of the environment results in the destabilization of the company economy and is a signal of transition from the safe state to the dangerous one [18]. The weaker economy, the stronger negative phenomenon in society it becomes. Only the legally capable and well organized state will compel individual and group interests to submit to the current legislation.

The role of the state in providing economic security of business through the macroeconomic function of development is displayed through creation of necessary terms and conditions (economic, political, informative, legal etc.). By protecting the economic interests of companies, the state creates suitable conditions for their safe functioning and steady development. Furthermore, it also facilitates the growth of economy by forming healthy competition environment and pre-conditions for investment promotion that indisputably will have a positive influence on business security. To

achieve that aim the state, as a rule, uses different kinds of protective measures and organizationally-economic factors and mechanisms. In the other case, an ineffective economic policy could be a potential threat to the economic security of the state.

Provision of economic security through functions and mechanisms of state administration facilitates the construction of the effective business security system with the use of state as well as non-state mechanisms and institutes allowing decreasing risks and threats.

Investigating the role of the state in provision of business economic security, it should be noted that the basic influence on organizational processes is carried out through the state management function. The fundamental principle is a fact that the interests of the state and business participants should not acquire a conflict form in this process.

The necessity of such type of relations, in particular, is confirmed by the experience and successes of Japan, South Korea, Taiwan and other states which national strategies are characterized by a close collaboration between the state and business for the sake of achievement of certain positions in certain world market industries.

The analysis of the role of state administration in relation to its influence on economic business security has showed that this process took place mainly by the realization of its functions such as: regulating and control which are characteristic for the market economy and legal state. The state, regulating the whole complex of relations, provides necessary conditions for coordination of interests of the state, region, business activity, company and person [15, p. 7].

The world experience shows that the state's role grows in providing of economic security, especially in the period of overcoming the crisis phenomena. It is the state which guarantees the existence of freedom of competition and market relations development [18, p. 4]. However, the matter of how to do it, which directions to follow and what mechanisms to use for this purpose remains in the spotlight not only for Ukraine but also for many states of the world.

Thus, from the point of view of construction of the effective economic security system the organizational mechanisms of the state administration of economy are necessary in order to: 1) prevent threats and dangers; 2) settle the conflicts of the market participants; 3) improve the management risks; 4) eliminate conditions which assist economic violations and crimes; 5) introduce rules, criteria and standards minimally needed and obligatory for all market participants; 6) put in order the cooperation mechanisms for protection of interests of economic relations participants on the market; 7) apply the influence and enforcement measures etc. [19, p. 14].

The role of the state in forming the economic security function in final result consists of the creation of such mechanisms and possibilities which would provide self-sufficiency and firmness of economic system of business development. At the same time, the state which is unable to form such mechanisms and possibilities plays a negative role in the business economic security system, i.e. it transforms from the factor of providing economic security into the source of threat.

Fundamentally important for economic security provision is the use of mechanisms of cooperation of the business economic security system and the state security system. For example, a substantial help for the business security would be information about the illegal actions of multinational corporations, raider captures, infiltration of representatives of the organized criminal groups into the administrative structures etc. Thus, the systems of economic security of business structures and state must cooperate and in such a way facilitate each other in execution of their characteristic functions and decision regarding the tasks put before them. The practice of such cooperation takes place in the USA, in a number of the European countries, as well as some other countries worldwide.

Analysing the business-environment of Ukraine, we should note that the economic security level of business is low here as well as in most countries of post-Soviet space. Such state of affairs is affirmed by the following:

1. The considerable part of companies are unprofitable (in any economic branch this index is below 30 %); both the amount and shares of operating companies is being reduced; the reduction rates of operating companies amount exceed the increase rates of newly created companies.

2. The sales volumes (inflation adjusted) in base economy branches industries are not considerable (industry, building, agriculture, services and other).

3. The indices of financially-economic activity efficiency and use of the companies resource provision are unsatisfactory.

4. The companies liquidity indices are low (accounts payable in all industries exceed accounts receivable, and in such industries of economy as agriculture, education and health protection is two times higher).

5. The companies practically do not send money to the extended reconstruction and innovations realization as important constituents of strengthening of the economic security (only every fifth company carries out a capital investment, the share of capital investments per 1 company is low). The companies function in the considerable risk level conditions, however they practically do not use any insurance and self-insurance tools.

6. The amount of the criminal attacks on businessmen, the so-called: "raiding", corruption and discriminatory actions is growing, including such actions by the representatives of public authorities.

7. The competitiveness level of most native companies is low, especially in comparison with foreign companies (native companies demonstrate low activity in relation to export activity realization (the share of subjects which carried out export operations in 2011 was 6,1 %); there is substantial reduction of the industrial companies-exporters share).

8. Taking into account the absence of free financial resources, the companies are unable to form the effective system of provision of the proper level of commercial secret and physical security of own property and personnel. [2]

Within the years of independence, no effective system of business security in Ukraine which would meet international standards and satisfied the necessities of every business entity subject has been created.

According to the data of the global economic crime survey conducted by PricewaterhouseCoopers Company, the most common economic crimes in Ukraine and in the world in 2012 were the following: unfair competition, financial report manipulations, corruption and bribery, misappropriation of property, and computer crime (see Fig.1.4.)

THE MOST COMMON ECONOMIC CRIMES IN UKRAINE AND IN THE WORLD IN 2011

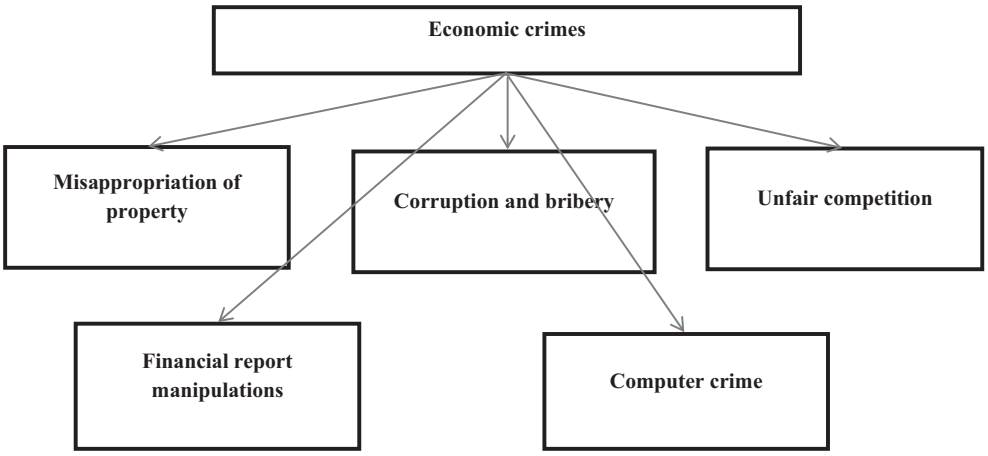


Fig. 1.4. The most common economic crimes in Ukraine and in the world in 2012

By means of analysing threats and dangers we can find out in what direction the Ukrainian positions have changed in comparison with other countries.

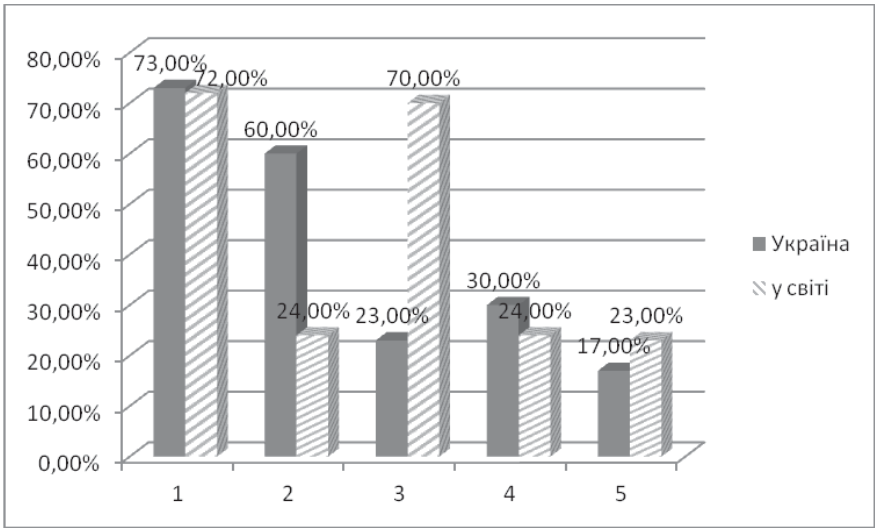
Table 1 Types of abuses in Ukraine considerably different from the ones present in the Central and Eastern Europe and world countries in 2011

Name of region	Bribery and corruption	Unfair competition
Ukraine	60%	23%
Central and Eastern Europe	36%	12%
World	24%	7%

Source: made by the author on the basis of [19]

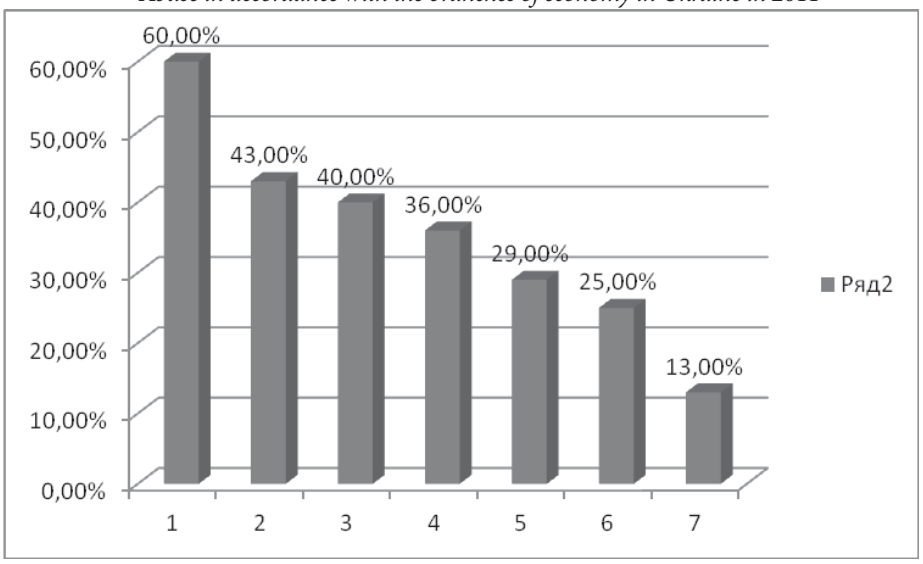
The analysis of data presented in the above table testifies that the Ukrainian companies more frequently suffer from bribery, corruption and unfair competition than the other countries in Central and Eastern Europe and in the world (Table 1).

The review of economic crimes in the world indicates the growing threat of computer crime. Nowadays, many people and organizations use different technologies, including the Internet. Thus, they encounter potential risks of swindlers attacks from all parts of the world. In the background of such problems, as data theft and information leakage, computer viruses and hacking attacks, the special attention is paid to the meaningfulness of this type of economic crimes and its influence on the world business.



1	Misappropriation of property	Ukraine	world
2	Corruption and bribery	73.00%	72.00%
3	Unfair competition	60.00%	24.00%
4	Financial report manipulations	23.00%	70.00%
5	Computer crime	30.00%	24.00%

Abuse in accordance with the branches of economy in Ukraine in 2011



Source: made by the author on the basis of [19]

1	Financial services sector	60.00%
2	Power engineering and mining	43.00%
3	Communications	40.00%
4	Retail and consumer goods production	36.00%
5	Insurance	29.00%
6	Company-production	25.00%
7	Consultation services	13.00%

Table 2: Position of Ukraine in the world ranking

Index	**Position of Ukraine/ amount of countries in rating**		**Change**
	2012	2011	
Failed State Index	113/177	110/177	+3
Human Development Index	78/187	77/187	-1
Global Peace Index	71/158	69/153	-2

Corruption Perceptions Index	144/174	152/182	+8
Global Competitiveness Report Index	73/144	82/142	+11
Index of Globalization	44/208	53/208	+9
Ease of doing business Index	137/185	152/183	+15
Press Freedom Index	116/179	131/178*	+15
Index of Economic Freedom	163/179	164/179	+1

Source: made by the author on the basis of [19]

In the process of analysing the real threats and dangers, we should note that a business sector requires a reliable protection, timely exposure, prevention and neutralization of threats. It can be achieved due to the joint efforts of both public organs and non-state institutions. The legal field should be the basis for the construction of the present system as the national security component. The business should develop and progress in this field. The system approach should be the main value criterion of such legal field, i.e. a number of legislative acts which will complement each other should be worked out, without contradictions and defects and which will provide the best terms and conditions for business development and prosperity in the country. [4]

The analysis of the real and potential threats which have arose in the economic sphere of many countries of the world allows us to approach the question of construction of the effective business security system at a more integral level. Such an approach forces the society, researchers and practical workers to look for the effective ways of problem questions solution, development of new paradigm and a system approach to the creation of the effective, highly organized system of the person and company security. Moreover, it is the basis for the creation of a new and high-quality product on the services market aimed at providing security of business entity.

Taking into account the above mentioned, we should note that building of the effective business security system as an important part of national security requires a study and consideration of the best works of native practical experience as well as experience of the developed countries. Moreover, it also needs a study of errors made in this sphere by other countries and their consequences.

REFERENCES

1. Безпекотворення в Україні та Росії: [збірник наук. праць /наук. ред. І.І. Тимошенко та ін.].—К. : Вид-во Європейського університету, 2008.- 255 с
2. Головне управління статистики у Львівській області. Статистичний щорічник Львівської області за 2011 рік (ч. І). [збірник .].Львів,2012.- 370 с.
3. Промислова політика як чинник післякризового відновлення економіки України. – К.:НІСД, 2012. – 41 с.
4. Щодо реалізації Громадянського проекту «Недержавна система безпеки підприємництва». [Електронний ресурс]. – Режим доступу: http://www.uspp.org.ua/security/system/2.
5. Новікова О.Ф. До проблеми визначення пріоритетів та складових національної безпеки України / О. Ф. Новікова, Р. В. Покотиленко // Стратегічна панорама. – 2003. – № 2. – С. 43–57.
6. Власюк О.С. Теорія і практика економічної безпеки в системі наук про економіку / О.С. Власюк // Нац. ін.-тпробл. міжнар. безпеки при Раді нац. безпеки і оборони України. – К., 2008. – 48 с.

7. Михалкин Н. В. Безопасность Российской Федерации. Вопросы теории и практики / Н. В. Михалкин. – М., 1993. – С. 13.
8. ороткий Ю.Ф. К вопросу о понятии безопасность /Ю.Ф.Короткий // Социально-политические аспекты обеспечения государственной безопасности в современных условиях : сб. статей. – М. : Іраница, 1994. – С. 51.
9. Ожегов С. И. Словарь русскогоязыка / С. И. Ожегов. – М. : Русский язык, 1991. – С. 47.
10. Молчановский В. Ф. Безопасность – атрибут социальной системы / В.Ф.Молчановский // Социально-политические аспекты обеспечения государственной безопасности в современных условиях : сб. статей. – М. : Іраница, 1994. – 368 с.
11. Економічна безпека підприємства : сутність та механізм забезпечення : монографія / Г. В. Козаченко, В. П. Пономарьов, О. М. Ляшенко. – К. : Лібра, 2003. – 280 с.
12. Сенчагов В. К. Экономическая безопасность России. Общий курс / под ред. В. К. Сенчагова. – М. : Дело, 2005. – 896 с.
13. Економічна безпека в Україні : держави, фірми, особи : навч. посібник / [А. Я. Реверчук, Я. Й. Малик, І. І. Кульчицький, С. К. Реверчук] ; за ред. С. К. Реверчука. – Львів : ЛФМА-УП, 2000. – 192 с.
14. Власюк О.С. Теорія і практика економічної безпеки в системі наук про економіку / О.С. Власюк // Нац. ін.-т пробл. міжнар. безпеки при Раді нац. безпеки і оборони України. – К., 2008. – 48 с.
15. Минаев Г. А. Безопасность организации : учебник / Г. А. Минаев.– К. : КНТ, 2009. – 440 с.
16. Сальников В. Проблемы экономической безопасности / В.Сальников. [Электронный ресурс].– Режим доступа: http://www. univermvd.ru.
17. Франчук В.І. Загрози корпоративній безпеці як об'єкт дослідження / В. І. Франчук // Актуальні проблеми економіки : економічний журнал. – 2009. – Вип. 9 (99). – С. 148–155.
18. Франчук В. І. Економічні злочини як форма загрози економічній безпеці / В. І. Франчук // Актуальні проблеми протидії злочинам у сфері економіки : матеріали Всеукраїнської наукової конференції (Львів, 26 березня 2010 р.). – Львів : ЛьвДУВС, 2010. – С. 14–17.
19. Україна. Всесвітній огляд економічних злочинів. [Електронний ресурс].– Режим доступу:: http://www.pwc.com.ua

UDC: 327.56::351.86

THE COPENHAGEN SCHOOL: WHO HAS THE RIGHT TO SURVIVE WITHIN THE NEW MULTISECTORAL SECURITY AGENDA?

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Abstract: *The end of 20th century has brought new challenges and new debates to the security studies scholarship. Once dominant, the classical approach for studying security has been challenged by the scholars who have tried to distance their work from the state-centric and military framework. The question that scholars have opened up for the debate was: should the state still be the only referent object of security. Consequently, depending on their answer and the definition of a referent object, the scholars had been divided between the traditional and the critical line of thought. The traditional approach defines the state as the only referent object on a security agenda. However, not all agree. Scholars within the Copenhagen Conflict and Peace Research Institute (COPRI), later on known as the Copenhagen School, have emphasized the need for braking away from the traditional state-centric fixation and for broadening security agenda in order to include the newly emerged non-state and non-military issues. Drawing on this debate, the purpose of this paper is to present the new referent objects for security and the role of the state, as one of the objects, within the non-traditional security analysis developed by the Copenhagen School.*

Key Words: Copenhagen School, the concept of security, sectoral security, the new multi-sectoral security agenda, state, non-state and non-military threats.

The post-Cold War shift in the structure of the international system has led to significant changes in the international relations scholarship. The end of bipolar confrontation, which framed the analysis of international relations in power based politics, opened the international agenda for new developments and new approaches. Once dominant focus on nation state and national security, as key concepts for understanding international relations, was challenged with the following question: "would traditional military state-centric approach be of much use with bipolarity gone?"[2] Such trends and challenges introduced a new branch of international relations studies – the critical and constructivist international relations theories. The scholars from this newly emerged line of thought engaged in the wide debate with the traditionalist, neorealist, scholars over the changing nature of international relations. Drawing from the Alexander Wendt's article *Anarchy is what state make of it: the social construction of power politics,* the scholars argue that instead of the distribution of power the "distribution of knowledge"[3] is what effects states' international behavior. According to them, ideas, norms and identities create collective meanings that "constitute the structure which organizes our actions".[4]

Furthermore, the critiques of the traditionalist scholarship emphasize that the changes that emerge with the end of the Cold War politics had unprecedented effect on the very nature of international relations. The state and military dominated perspective of international relations changed and such change had to be followed by the re-conceptualisation of old concepts and development of new ones that would reflect the new trends of the contemporary world politics. Therefore, in order

1 This paper is the result of the Scientific Research Project entitled „*The Development of Institutional Capacities, Standards and Procedures for Combating Organized Crime and Terrorism in the International Integration Conditions*". The Project is financed by the Ministry of Science and Technological Development of the Republic of Serbia (No 179045), and carried out by the Academy of Criminalistic and Police Studies in Belgrade (2011–2014). The leader of the Project is Associate Professor Saša Mijalković, PhD.

2 Berry Buzan, and Lene Hansen, *The Evolution of International Security Studies* (Cambridge: Cambridge University Press, 2009): 158.

3 Alexander Wendt, "Anarchy is what States Make of it: The Social Construction of Power Politics," *International Organizations* 46, no. 2 (Spring, 1992): 397.

4 Ibid.

to make an effort towards understanding and interpreting contemporary international relations, the scholars within the international relations scholarship should step away from the traditionalist approach and engage in the re-conceptualisation and redefinition of the basic concepts of the discipline.

The same constructivist line of thought became a part of the security studies scholarship, with the emergence of the constructivist and critical security studies. The new security theories were developed as a challenger to the traditional, realist and neo-realist, theories that until 1990s dominated the field of security studies. According to the challengers, the traditional meaning of the concept of security as a security of the state from external, military threats had to be re-conceptualised in order to embrace security dynamics in the new environment.[5] The concept of security had to be diverged from military and from what Berry Buzan and Richard Little had marked as the "Westphalian straitjacket". According to Buzan and Little, the "Westphalian straitjacket" refers to the core concept of traditional security studies that assigns the state as the only referent object of security.[6] Drown by such incentives, critically orientated scholars, through the significant part of their work, engaged in redefinition of the basic meaning of security in order to include non-state and non-military aspects of the threat.

The most significant contribution to the above mentioned constructivist and critical attempts to redefine the meaning of the core concept of security has been made by the scholars within the Copenhagen Conflict and Peace Research Institute (COPRI), also known as the Copenhagen School. Drawing on the European security dynamics during 1990s, the Copenhagen scholars have engaged in the re-conceptualization of old and the development of new key concepts for the security studies scholarship. As a result the scholars introduced the concept of sectoral security and multi-sectoral security agenda. The motivation behind this endeavor was to develop analytical tools for the analysis of empirical changes in the European security agenda, which eventually departed from dealing only with the narrow military issues.[7] In other words, the new concepts were introduced with the purpose of broadening and deepening security of the old agenda in order to make space for non-military and non-state perspective of potential threats.

Following the presented dynamics in the security studies scholarship, the goal of this paper is to outline the new line of thought in the security studies through the work of Copenhagen School and the role of the state as a referent object of security within it. For that purpose the paper is to be organized in three sections. The first section focuses on Copenhagen's concept of sectoral security and multi-sectoral security agenda. The second section describes the role of state as a referent object of security within the Copenhagen's multi-sectoral agenda. In the end, the paper concludes that state as a referent object of security threats still remains an ideal security actor, but the security agenda can be influenced by other social factors. Hence, the security agenda for the Copenhagen School of security studies can be described as "an arena of competing actors".[8]

THE CONCEPT OF SECTORAL SECURITY

In order to make a genuine contribution to the post-traditional branch of security studies, the scholars within Copenhagen Conflict and Peace Research Institute have engaged in the 1990s debate about "conceptual reflections on the concept of security"[9]. Although, as Ole Weaver rightfully points out, the notions for and attempts to re-conceptualise the meaning of security have become a common phenomenon within security studies scholarship, the Copenhagen scholars have posed a valuable reply to such academic challenge.[10] Drawing from the developments in the European secu-

5 Mohammed Ayoob, *The Third World Security Predicament: State Making, Regional Conflict and the International System* (Boulder: Lynne Rienner, 1995): 5.
6 Berry Buzan and Richard Little, "Why International Relations has Failed as an Intellectual Project and What to do About It," *Millennium 30*, no. 1 (2001): 25.
7 Jef Huysmans, "Revisiting Copenhagen: Or, On the Creative Development of a Security Studies Agenda in Europe," *European Journal of International Relations 4*, no. 4 (1998): 482-486.
8 Barry Buzan, Ole Waever and Jap de Wilde, *Security: A New Framework for Analysis* (Boulder: Lynne Rienner, 1998): 37.
9 Ole Waever, "Securitization and Desecuritization," in: Ronnie D. Lipschutz (ed.) *On Security* (New York: Columbia University Press, 1995): 46.
10 Ole Waever, "Securitization and Desecuritization," 46.

rity agenda, that took place during the 1990s, the scholars have contributed the discipline with the formulation of the concept of the sectoral security and multi-sectoral security agenda. Nevertheless, these new developments have not been just a result of the scholars' willingness to make a genuine contribution to the security scholarship. According to Jef Huysmans, the Copenhagen scholars have also had more practical intentions in mind. The concept of sectoral security was formulated with the purpose of developing a tool for the analysis of the dynamic of security processes in the post-Cold War era[11].

The (traditional) meaning of the concept of security, as security of the state from external, military threats, has been challenged by the incentives for broadening and deepening security agenda, which came with the Copenhagen's concept of sectoral security. Even though regarded as a Copenhagen's contribution to the discipline, the concept of the sectors of security had been originally developed by Barry Buzan in the 1983 book *People, State and Fear: The National Security Problem in International Relations.*[12] The book defines post-Cold War security as a complex concept that cannot be reduced to a mere "synonym for power".[13] With that in mind and by reflecting on the traditional "narrowly founded"[14] concept of security, Buzan outlines five security sectors within which potential threats to the national security may emerge. According to Buzan, the national security agenda can be challenged not just by the threat and vulnerabilities that come from military sector but also by the ones that emerge from the political, societal, economical and environmental sectors. Nevertheless, these sectors do not function in isolation; they are interconnected and thus constitute a multi-sectoral security agenda.[15] The sectors cannot address the issue of security on their own, in fact each one is "complexly linked with the next forming a web of information that a Security Analyst or International Relationist must detangle to understand each concept individually in order to be able to see how they affect each other on the whole."[16] Consequently, as Ole Waever in the chapter *Securitization and Desecuritization* asserts, the concept of sectoral security has introduced non-military threats into the national security agenda and thus lead to the formulation of the wider concept of security.[17]

Although Buzan's concept of the security sectors contributed to the widening of the security agenda, further developments of the concept within Copenhagen theoretical framework during 1990s have resulted in the conceptualization of a general tool for analysis of the contemporary security dynamics. The concept of the security sectors developed in the 1983 opens the security agenda for the non-military threats, but it still closes the nature of the target of potential threats for any other object except state. However, as Huysmans rightfully notes, in the 1993 book *Identity, Migrations and The New security Agenda in Europe,* which is the result of Buzan and Waever's joint work, the concept of security sectors is presented not just as a tool for identifying threats outside military sector, but as a concept which has its own meaning.[18]

The newly re-defined concept of sectoral security identifies a peculiar security dynamic that takes place within a sector and implies linkage between threat and the constitution of the threatened objects. As security for the Copenhagen scholars is "about survival. It is when an issue is presented as posing an existential treat to the designated referent object"[19], the nature of the threatened object varies depending on the security sector. In addition, the success of the constitution of the threat is connected to the security sector within which it emerges. This connection is best presented through the example of societal sector where the relation between the emerging threats and the constitution of society and identity is emphasized by the Copenhagen scholars.[20]

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11 Jef Huysmans, "Revisiting Copenhagen", 482.
12 The revised edition of the book was published in 1991 under the title *People, State and Fear: An Agenda for International Security Studies in the Post-Cold War Era.*
13 Barry Buzan, *People, State and Fear: An Agenda for International Security Studies in the Post-Cold War Era,* (Hertfordshire: Harvester Wheatsheaf, 1991): 8.
14 Ibid., 14.
15 Ibid., 112-134.
16 Marianne Stone, "Security According to Buzan: A Comprehensive Security Analysis," *Security Discussion Papers Series 1* (Spring, 2009): 3.
17 Ole Waever, "Securitization and Desecuritization," 47-48.
18 Jef Huysmans, "Revisiting Copenhagen", 489-490.
19 Olav F. Knudsen, "Post-Copenhagen Studies: Desecuritizing Securitization," *Security Dialogue 32*, no. 3 (2001): 362.
20 Jef Huysmans, "Revisiting Copenhagen", 489-490.

In this way, the new more embracing concept of sectoral security introduced not just wider but deeper understanding of security. By outlining the new referent objects of security, which are affected by sectoral security dynamic, the Copenhagen's security agenda became open for threats that go well beyond military and state issues. Besides the state, which is defined as the referent object of the military and political sectors, the economic, societal and environmental sectors bring to the security agenda issues such as bankruptcy, collective identity, culture, economic integration, popular migration, survival of the species and the survival of the human civilization.[21] Thus, Michael Williams' article *Wards, Images, Enemies: Securitization and International Politics* rightfully concludes, security for the Copenhagen School can be viewed as the compression of all five sectors that have different referent objects and different threat agendas.[22]

THE STATE AS A REFERENT OBJECT

Copenhagen scholars emphasize that due to the military and state perspective of security, traditional security studies fail to address new security issues such as migration, transnational crime and interstate conflicts. In order to deal with this problem, the critical approach to security studies starts with re-conceptualization of the traditional notion of security with the purpose of including these new challenges in their theoretical framework. As one of the critical approaches towards studying security, the Copenhagen School has introduced the concept of security sectors. Their theoretical framework, through the multi-sectoral security agenda, recognizes that different sectors - military, political, economic, societal and environmental -have different referent objects.[23] In the military sector, the referent object is the territorial integrity of the state and threats are defined as external and military. The state is the referent object for the political sector, too. However, in the political sector, what is at stake is the legitimacy of a governmental authority and the threats are ideology and sub-state.[24] Three other sectors, economic, societal and environmental are more difficult to define due to their nature and the nature of threats that emerge within them. The economic sector is by itself insecure owing to the risks in market economy and this makes economic security difficult to describe. Be that as it may, the economic welfare is seen as the referent object of economic sector and issues such as bankruptcy and economic crises are viewed as potential security threats. Yet, the economic integration, which is usually linked with economic welfare, is marked as potential threat within the societal sector. Societal sector takes identity of a group as its referent object and defines threats in terms of identity and culture. It is important to stress that societal security is difficult to apply since it can lead to politics of discrimination and exclusion.[25] The environmental sector is the most controversial of five sectors, since it is usually linked with threats such as earthquakes and hurricanes that are impossible to control. In addition, the referent object in this sector - the environment - is a subject of global concern. Drawing from the above presented, it is possible to conclude that Copenhagen's multi-sectoral agenda can be seen as a variety of contexts within which security takes place.[26]

Although the new concept of security is deeper and wider than the traditional one, for Copenhagen scholars "security is about survival. It is when an issue is presented as posing an existential treat to the designated referent object." As Knudsen rightfully points out, the referent object, the "thing whose security is at stake", is the key notion within the Copenhagen approach.[27] Yet, the problem with this notion comes with Buzan, Waever and de Wilde's point that security is always politically constructed and could not be described as something real. That kind of position opens up the possibility for anything to become the referent object of security.[28]

21 Barry Buzan, Ole Waever and Jap de Wilde, *Security*, 22-23.
22 Michael Williams, "Wards, Images, Enemies: Securitization and International Politics," *International Studies Quarterly 47*, (2003): 513.
23 Claire Wilkinson, "The Copenhagen School in Tour in Kyrgyzstan: Is Securitization Theory Useable Outside Europe," *Security Dialog 38*, no. 5 (2007): 9.
24 Michael Williams, "Wards, Images, Enemies," 513.
25 Marianne Stone, "Security According to Buzan," 6.
26 Matt McDonald, "Securitization and the Construction of Security," *European Journal of International Relations 14*, no. 4 (2008): 571.
27 Olav F. Knudsen, "Post-Copenhagen Studies," 362.
28 Barry Buzan, Ole Waever and Jap de Wilde, *Security*, 36.

Another issue in the Copenhagen's framework is that at same time with the expansion of the traditional security agenda, with the concept of sectoral security, the scholars have introduced the notion of size or scale. This notion is seen as the determinant of what can be successfully "presented" as the referent object of security, in the first place. The scale, which is constituted by micro end, system end and middle scale, corresponds with the well-known levels of analysis in the security studies. The micro and the system end of the scale, as Buzan, Waever and de Wilde rightfully point out, have problems with establishing legitimacy of their referent objects. The reason for that is that a "few will listen"[29] to individual or small group demands and mass identity at the system level is unlikely to emerge. On the contrary, middle scale that represents limited collectives, and corresponds to the state level of analyses, is regarded as the most suitable referent object for security.[30] Therefore, although the scholars from Copenhagen school argue that referent objects for security can be found at the supra - or sub-state level, it is clear that they stay at the middle, state level. Marianne Stone also stresses this point as she argues that Buzan's multi-sectoral reading of security provides "understanding of every aspect that contributes to or affects security, from the individual and societal to the main referent, which for Buzan is the state."[31]

In addition, the re-conceptualized concept of security presented by the Copenhagen School failed to move the concept to either a system or an individual conceptualization of security. As Knudsen points out, the critical concept of security, which was developed with the purpose of making a distance from the traditional fixation with the state, keeps referring to the state nevertheless. The reason for this is that despite the different theoretical approaches within international relations studies, "the state continues to be there".[32] Drawing on that simple fact, the state should not be disregarded as the referent object of the security. Considering security functions that the state performs, and that are not performed by any other type of organization, it is not a surprise that security scholars keep on coming back to it. The state is the major collective unit processing the notions of threat and at the same time the organizational expression that gives shape to communal identity and culture. When it comes to providing security for the larger collective units, the state is the most efficient instrument of protection.[33] Nevertheless, the state is the instrument of power that is beyond the power of any organization, and, therefore, should be critically studied.

Buzan, Waever and de Wilde in their 1998 book acknowledge this necessary link that ties security to the state, but emphasize that there is a significant difference between the "state-centric approach" and the "state-dominated field". According to them, traditional security studies are mostly a state-dominated field. Contrary to that, the approach developed by the Copenhagen School represents an attempt to affirm the new concept of security, within which the state-centric position is possible but not a necessary one. There is no doubt that the state still remains the ideal security actor, but the contemporary security agenda can be influenced by other social factors. Therefore, the security for the Copenhagen School is not one (state) actor show. In fact, it is possible to describe it as "an arena of competing actors".[34]

CONCLUSION

The end of the bipolar competition, which shaped international relations for more than fifty years, brought significant changes to the international relations scholarship. The scholars argued that the challenges of the new era had to be reflected in the development of new and re-conceptualization of old concept of the discipline. With that in mind, the goal was to redefine the scholarship in order to fit the contemporary trends in international politics. The same line of thought and the same goal became part of security studies scholarship with the emergence of constructivist and critical security studies. The security scholarship was to be distanced from the power based "Westphalian straitjacket" that assigned the state as the main focus of security.

29 Ibid.
30 Ibid.
31 Marianne Stone, "Security According to Buzan," 2.
32 Olav F. Knudsen, "Post-Copenhagen Studies:," 362.
33 Olav F. Knudsen, "Post-Copenhagen Studies", 363.
34 Barry Buzan, Ole Waever, Jap de Wilde, *Security*, 37.

Yet, all scholars have not accepted the above goal and the need for change in the scholarship. As a consequence, the debate about the concept of security makes security scholarship one of the most dynamic fields in international relations studies. The contemporary debate between traditional and critical security studies regarding the definition of the referent object of security has produced valid arguments on both sides of the debate. The scholars that belong to the traditional branch of security studies rightfully claim that the state as the largest collective unit that possesses the power beyond any other type of collective organization should not be neglected as a referent object of security. However, the critical approach within security studies, developed by the Copenhagen School, emerges with the purpose to distance security studies from state-centrism and to develop a new concept of security. The new concept was presented through sectoral security that broadened the security agenda for non-state and non-military issues. Nevertheless, the scholars of the Copenhagen School failed to leave the state behind and through their further work they have developed a wider concept of security that recognizes the state-centric approach as one of the legitimate possibilities.

REFERENCES

1. Ayoob, Mohammed. *The Third World Security Predicament: State Making, Regional Conflict and the International System.* Boulder: Lynne Rienner, 1995.
2. Buzan, Barry. *People, State and Fear: An Agenda for International Security Studies in the Post-Cold War Era.* Hertfordshire: Harvester Wheatsheaf, 1991.
3. Buzan Berry, and Lene Hansen, *The Evolution of International Security Studies*. Cambridge: Cambridge University Press, 2009.
4. Buzan, Barry, Ole Waever, and Jap de Wilde. *Security: A New Framework for Analysis.* Boulder: Lynne Rienner, 1998.
5. Buzan Berry, and Richard Little. "Why International Relations has Failed as an Intellectual Project and What to do About It." *Millennium* 30, no. 1 (2001): 19-39.
6. Huysmans, Jef. "Revisiting Copenhagen: Or, On the Creative Development of a Security Studies Agenda in Europe." *European Journal of International Relations* 4, no. 4 (1998): 479-505.
7. Knudsen, Olav F. "Post-Copenhagen Studies: Desecuritizing Securitization." *Security Dialogue* 32, no. 3 (2001): 355-368.
8. McDonald, Matt. "Securitization and the Construction of Security." *European Journal of International Relations* 14, no 4. (2008): 563-587.
9. Stone, Marianne. "Security According to Buzan: A Comprehensive Security Analysis." *Security Discussion Papers Series 1* (Spring, 2009).
10. Waever, Ole. "Securitization and Desecuritization." in Ronnie D. Lipschutz (ed.): *On Security.* New York: Columbia University Press, 1995.
11. Wendt, Alexander. "Anarchy is what States Make of it: The Social Construction of Power Politics." *International Organizations* 46, no. 2 (Spring, 1992): 391-425.
12. Wilkinson, Claire. "The Copenhagen School in Tour in Kyrgyzstan: Is Securitization Theory Useable Outside Europe." *Security Dialog* 38, no. 5 (2007): 5-25.
13. Williams, Michael C. "Words, Images, Enemies: Securitization and International Politics." *International Studies Quarterly* 47, no. 1 (2003): 511-531.

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CLASSIFICATION OF EMERGENCY SITUATIONS

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Abstract: There is no universally accepted definition or classification of an emergency situation. Adoption of a universally and generally acceptable classification of emergency situations represents one of the important challenges the researchers, competent governmental authorities, and international organizations have to face.

The classification of emergencies in this paper has been made on the basis of analyses of different sources, such as course books, articles, internet sites, relevant international and national reports, etc. Based on this, several criteria have been proposed for defining classification of emergencies. Justification and acceptability of classification of emergency situations constitute an important prerequisite for their valid recording and better quality analysis, as well as for the international cooperation of governments, authorities in charge, members of the scientific community and non-governmental organizations from that field of work. This paper gives a short overview of the classification of emergency situations, with a special focus on the USA, the Russian Federation, China, the Netherlands, Germany and Serbia.

Key words: *emergency situations, concept, classification, criteria, members.*

INTRODUCTION

The classification is not only important for science, but it is also one of the basic components of the common sense thinking. It is used in the process that goes from identification[1] to comparison, as a logical action. In order to be feasible, the classification needs to be supported by a derived description of the subject of consideration, i.e. of the research.

The researches that have been conducted so far, being predominantly focused on the classification of emergencies, are very rare. Moreover, scientific endeavours tackling description and explanation of certain subjects of research concerning emergencies or the research as a whole, where these researches partly relate to the classification of emergencies, are far more present. It means that classifications of emergencies, partly or as a whole, are present, but only as side contents of descriptive and explanatory researches in the field of emergency issues. At the same time, it is a part of research relating to the emergencies that is most often implemented on a low-profile basis. This can be argumented by the absence of the analysis of derived classifications of emergencies from the aspect of their validity. As a consequence, there is a confusion in the meaning of certain terms that are of importance for the understanding of the concept of emergency situations, their main attributes, their transformation into criteria (division principles), as the contents of classification, i.e. members of these classifications relating to certain types of emergencies. The mentioned facts indicate the necessity of researching the classification of emergency situations, to which this paper has been actually dedicated.

All the classifications, including the one relating to emergencies, consist of *three constituents:* subject of division, criteria and members. It should be however noted that requirements concerning the validity of classification represent the theoretical and logical conditions that should be met by the classification so that it could be classified as a scientific classification. Therefore, given the abovementioned, the subject of research of classification of emergencies refers to the following: 1) defining the emergencies, 2) examining validity of selection criteria and 3) members of the division of emergencies, in relation to the requirements of classification validity.[2]

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1 «Identification and transfer of important features or characteristics of a certain category of objects or events. This actually indicates the statement that a descriptive research has elements of a classifying nature"(Fitzgerald J.D, Fox M.S: *"Methodology of Research in Criminal Sciences"*, translated from English by: Bakic I, Muratbegovic E, Faculty of Criminal Sciences, Sarajevo, 2001, p. 269.).

2 In principle, researches of classifying contents should contain three parts: (1) theory determination of the subject of division, (2) identification of the division criteria and (3) identification of the members of division (Субошић, Д: *Researches of classifying contents in the field of safety*, Vojno delo, No 1 (2009), pp. 227-241.

In order to make a classification (typology) of all the subjects of division, and of emergencies, too, researches of the classifying contents should be prepared, organized and implemented. The objective of such researches is a valid classification (typology) of the subject of division. It means that classification of emergencies should be logical and theory based, but also beneficial. More precisely, derived classification should be made by a verification of hypothesis based on statements relating to the similarities and differences of criteria that have been used for the classification and of the members they contain. Moreover, the indicators of such hypotheses should align with the review of validity of criteria (historicity and structurality criteria) and of members (consistency, completeness, exhaustiveness, non-interference of members and discriminativity). Apart from the mentioned theory qualities, the classification should have a pragmatic-teleological qualities relating to its ability of practical implementation in terms of facilitating the undertaking of proactive measures for the prevention of occurrence of an emergency or measures for reaction, i.e. confrontation with already occurred emergencies. Also, the classification is useful if it allows for the implementation of the same or similar proactive or reactive measures in cases of same or similar types of emergencies. Finally, future classifications should be pragmatic in terms of manageability of the number of types of emergencies. Differences between them should be wide enough to ensure avoidance of classifications that have exclusively a scientific implementation, i.e. a theory importance.

DEFINITION OF EMERGENCY SITUATIONS

The research of the classifying contents begins with the theory determination of the subject of research, where the ultimate objective is to define the subject of division. This does not incur only from the need that researched terms should be unequivocally and validly determined from the aspect of their contents and scope, but also for the sake of the dialectical unity of definition and classification. Therefore, in the absence of a definition of the term that is subject to division, it will not be possible to apply the classification criteria for determining the types of such terms.[3]

The content of a term is determined by its unambiguous definition. It means that "What is being defined – is being classified". Namely, in order to validly define the term of emergency and in order to derive a valid classification on the basis of the incurred (adopted) definition, it is necessary to separate the term of emergency situation from the similar terms, such as: *disaster, catastrophe, emergency, hazard, adversity, accident, major incident.*

Main features used for defining a certain term are called attributes, among which the classification criteria are being identified. As a consequence, the classification will have the members that are the result of the subject of division determined by a definition and the accordingly applied criteria, i.e. the principle of division. Thus the classification of the same term that has been defined by various main features will contain different criteria by means of which it has been derived and consequently different members. This may mean that both hypothetical classifications that have been derived from different definitions of the term of emergency are valid, or not valid, as well as that one is more valid than the other, i.e. one can be valid according to certain requirements, and not valid according to other requirements, etc.

The definition of emergency that is mostly used in Serbia is the one of doctrinary type, contained in the *Law on Emergency Situations*, reading that "*The conditions in which risks and threats or consequences of catastrophes, extraordinary incidents and other hazards threatening the population, environment and material goods are of such a volume and intensity that their occurrence or consequences can not be prevented or eliminated by regular action from the part of authorities and services in charge, due to which it is necessary to deploy special measures, forces and means together with the enhanced work regime, in order to mitigate or eliminate them*".[4] In order to be of scientific importance, this definition, likewise all others, should be accurate (precise), adequate (corresponding to the term that it unambiguously determines), equivalent (equal to the scope of the term), not circular (does not define the term by the same term) and not negative (does not determine the term by what this term does not actually stand for, but by what it really means). The validity of the mentioned definition is tested by the following table.

3 Ibid.
4 *Law on Emergency Situations*, Official Gazette of RS, No. 111/2009, 92/2011 and 93/2012.

Table 1: The analysis of validity of definitions of emergency situations[5]

Features of a valid definition \ Definition	*The conditions in which risks and threats or consequences of catastrophes, extraordinary incidents and other hazards threatening the population, environment and material goods are of such a volume and intensity that their occurrence or consequences can not be prevented or eliminated by a regular action from the part of authorities and services in charge, due to which it is necessary to deploy special measures, forces and means together with the enhanced work regime, in order to mitigate or eliminate them.*	Validity statement
Accuracy	*... and other hazards...*	-/+
Adequacy	Intensity of hazards and intensity of engagement	+
Equivalence	Condition, hazards, consequences, protected values, measures, forces, means, work regime	+
Non-circularity	Term that is being defined (extraordinary situation) is not mentioned in the text of the definition	+
Non-negativity	*... their occurrence or consequences **can not** be prevented or eliminated by a regular action from the part of authorities and services in charge, due to which ...*[5]	-/+

The analysis of the mentioned definition of emergency situations shows that it is mostly valid theory-wise, whereas it is not its purpose. This is due to its doctrinary sense, i.e. the normative-legal character, given the fact that the legal, but not theory determination, is in question. The purpose of this analysis is in pointing out that the definition of the same term can be different and that can occur, for example, by removing its theory shortcomings. Thus the basic features of the term *emergency situation*, used for expressing its sense, would be somehow different, which would bring about the change of the classification criteria, and consequently the types of emergency situations.

The Russian and American doctrinary definitions of emergency situations belong to the group of more important definitions. The first reads as follows: "According to the *Law on Protecting the Population and Territories from Emergency Situations of Natural and Technogenic Character*, an emergency situation is understood to be the situation characterized by disruption of normal living and working conditions of people, endangerment of their lives and health, making damage to the property of the population, national industry and environment, as a result of the occurrence of causes of emergency situations in facilities, territories or aqua-territories".[6] On the other hand, according to the Manual of the American Federal Emergency Management Agency (FEMA), an emergency situation is defined as: «A non-planned situation that can provoke considerable injuries of employees, users or wider population and make damage to a great extent to the natural and material goods, as well as the possibility of having an impact on the company's reputation and deteriorating its financial condition."[7] By generalizing the mentioned features of emergency situations from the previous two definitions, one can notice their common characteristic. It refers to the „disruption of *normal* living and working conditions of people", but not to the intensity of hazards and response to them, as it is the case in the definition from the *Law on Emergency Situations* of the Republic of Serbia. However, one should bear in mind that the «disruption of normal living» is somehow culturally determined. For example, in the most developed countries, the «disruption of normal living»

5 It is the problem of assessing the adequacy of measures, particularity of forces, etc. which will be discussed in more details in the text below.

6 Федеральный закон РФ от 21.12.1994 N 68-ФЗ (ред. от 01.04.2012) „О защите населения и территорий от чрезвычайных ситуаций природного и техногеног характера".

7 Federal Emergency Management Agency, s Mitigation Directorate Fact Sheet, FEMA Website, www.fema.org.

can be a consequence of the absence of Internet, while the lack of water would be an example for the same in the poorest countries. So, the syntagm «disruption of normal living" is rather indefinite, and is no suitable for a definiens, i.e. for the term that is in the function of the unambiguous term of definiendum (the term that is being defined).

Apart from the precise and unambiguous determination of the term that is subject to division (in this case this is the emergency situation), this part of the work highlights the dialectical unity of the definition and classification (typologization)[8]. Thus the methodological statement has been accepted saying that imperfect definitions encourage the making of valid classifications (typologizations) and vice versa (imperfect classifications represent the cause of the more valid defining). Finally, an unambiguous determination of emergency situations brings about conditions for their classification.[9]

Quarantelli (1985, 2006) defines the disasters in the context of requirements and possibilities of the community to fight against the extreme incident and define it as a crisis opportunity where the requirements have exceeded the possibilities, offering the following division related to the intensity and resources of the community: 1. Crisis: Abilities (possibilities) exceed the needs, 2. Emergency situation: Abilities satisfy or exceed the needs to a certain extent, 3. Disasters: The needs exceed the abilities (possibilities), 4. A big disaster: The needs fight over (surpass) the abilities completely. Various influences of extreme natural events with various intensities are shown in the table 2.

Table 2 Comparison of event magnitude *(Source*: McEntire (2007), p. 3.)

	Crisis	Emergency/disaster	Calamity/catastrophe
Injuries	Many	Scores	Hundreds/thousands
Deaths	Many	Scores	Hundreds/thousands
Damage	Moderate	Major	Severe
Disruption	Moderate	Major	Severe
Geographic impact	Dispersed	Dispersed/diffuse	Diffuse
Availability of resources	Sufficient	Limited	Scarce
Number of responders	Many	Hundreds	Hundreds/thousands
Time to recover	Days/week	Months/years	Years/decades

IDENTIFYING CRITERIA FOR CLASSIFICATION OF EMERGENCY SITUATIONS

Identification of division criteria includes the questions of: (1) registering to-date classification criteria (typologizations) that refer to emergency situations and (2) comparison of classification criteria (typologization) for emergency situations according to the requirements relating to their validity. The examination of the proposed classification criteria are conducted in accordance with the methodological recommendations. They recommend in the first place that the classification should be made on the *historical-comparable basis.* This is in line with the application of the historical-comparative method and analysis of the contents (for the purpose of collecting data on the historical-geographic representation of certain criteria).[10]

By registering the existing criteria for classification of emergency situations, a suitable starting point is made for their mutual comparison, for the purpose of determining the most valid one. The mentioned comparisons are carried out in relation to the theory requirements concerning the validity of classifying. The objectives of these actions refer to the examination of validity of the existing divisions and selection of criteria that will be compared with the proposed principals of division of emergency situations.

8 Typologization is a type of classifying established by a simultaneous implementation of two and more criteria within the same subject of division. Therefore, the classification occurs by intercrossing elementary classifications (those classifications that were made by means of one criterion). As such, classification represents a more valid method of classifying than the elementary classifications, especially when complex subjects of divisions are in question.

9 Compare: Subošić, D: *Researches of classifying contents in the field of safety*, Military Journal, No 1 (2009), pp. 227-241.

10 *Ibid.*

A valid distribution of a subject to division is the one that satisfies the theory and logical requirements of the classification. Mentioned requirements belong to the ones that relate to the criteria (theory) and those relating to the members (logical) of divisions. The requirements concerning valid classification that relate to the criteria are historicity and structurality.[11] Thus the conditions for the analysis of validity of classification criteria of emergency situations deriving from the definition of emergency situations contained in the *Law on Emergency Situations* have been provided.

The analysis of the mentioned definition offers the conclusion that the next of kin is the "condition", and the typological difference: "the risks and threats or consequences of catastrophes, extraordinary incidents and other hazards threatening the population, environment and material goods are of such a volume and intensity that their occurrence or consequences can not be prevented or eliminated by a regular action from the part of authorities and services in charge, due to which it is necessary to deploy special measures, forces and means together with the enhanced work regime, in order to mitigate or eliminate them". By analyzing the typological difference, it can be concluded that "… hazards threatening the population, environment and material goods are of such a volume and intensity … deploy special measures, forces and means together with the enhanced work regime" constitute its essence. So, the intensity of hazards and intensity of deployment make the essence of the emergency situations, i.e. their main feature. This characteristic (intensity) of emergency situations exceeding the available response capacities is actually the attribute that is suitable for the transformation into a classification criterion.

Therefore, emergency situations per intensity criterion can be divided into emergency situations of low, medium and high intensity. Such a division is symmetrical to the division of conflicts, they being particular emergency situations per intensity (conflicts of low, medium and high intensity are well known). However, the problem of measuring the mentioned intensity becomes evident in the process of classifying emergencies, as well as the problem of its historicity (as it does not indicate the occurrence and development of emergency situations), and also of its structurality (as it does not indicate a substantial structural feature of emergency situations). Division of emergency situations that is derived from the intensity as a criterion of division of emergencies refers to the members such as: minimum, small, moderate, severe and catastrophic emergency situations.[12]

The intensity can be a classification criterion in emergency typologies. For example, emergency situations are classified by using intercrossing criteria (and classifications that result from their application) relating to the *penetration and intensity* in the typologies of the scientists from Russia [13] and the USA[14] (tables 3 and 4).

Table 3: Typology of emergency situations by using penetration and intensity criteria

Emergency situation penetration	Indicators and values of intensity of emergency situations			
	Number of casualties in emergency situations	Number of people with disrupted living and working conditions	Scope of material damage in relation to MCR*	Boundaries of the emergency situation zones
Local	Up to 10	Up to 100	1000 MCR at the most	Emergency situation zone does not stretch out of the borders of the object's territory

11 For further details see: Субошић, Д: *Researches of classifying contents in the field of safety*, Vojno delo, No 1 (2009), pp. 227-241.

12 *Guidelines concerning the methodology for the making of the assessment of hazards and protection and rescue plans in emergency situations,* "Official Gazette of RS", number 96/12.

13 Source: Основы защиты населения и территорий в кризисных ситуациях / Под общ. ред. Ю.Л. Воробьева. МЧС России. М.: Деловой экспресс, 2006.

14 Bimal Kanti Paul: *Environmental Hazards and Disasters: Contexts, Perspectives and Management* focuses; Publisher: Wiley; 1 edition (2011), 334 pages

Emergency situation penetration	Indicators and values of intensity of emergency situations			
	Number of casualties in emergency situations	Number of people with disrupted living and working conditions	Scope of material damage in relation to MCR*	Boundaries of the emergency situation zones
Municipal	10-50	100-300	Over 1000, but not more than 5000 MCR	Zone of the emergency situation does not stretch outside the municipality boundaries
Inter-municipal	10-50	100-300	Over 1000, but not more than 5000 MCR	Zone of the emergency situation encompasses 2 and more municipalities of one subject of the Russian Federation (RF)
Regional	50-500	300-500	Over 5000, but not more than 500000 MCR	Zone of the emergency situation does not stretch outside the boundaries of the RF subject
Inter-regional	50-500	500-1000	Over 500 000, but not more than 5 000 000 MCR	Zone of the emergency situation encompasses territories of 2 and more RF subjects
Federal	Over 500	Over 1000	Over 5 000 000 MCR	Zone of the emergency situation does not stretch outside RF boundaries
International	Zone of influence of negative factors exceeds the boundaries of the Russian Federation or an emergency situation occurred abroad and included the territory of the Russian Federation * MCR – minimum price of work			

Table 4: Classification of emergency situations by Gad-el-Hak (Paul, (2011)

Class	Number of persons killed/injured/displaced/affected	Area of impact (in square km)
Scope I (small disaster)	<10	<1
Scope II (medium disaster)	10–100	1–10
Scope III (large disaster)	100–1000	10–100
Scope IV (enormous disaster)	1000–104	100–1000
Scope VI (gargantuan disaster)	>104	>1000

However, emergency situations are most often classified according to the following types of criteria: 1. time (description: unexpected, speed of emergency development); 2. socio-environmental (description: human victims, epidemics, mass destruction of the cattle fund, reorientation of the production, use of the considerable quality of natural resources); 3. socio-economic (description:

big adversity, great hazard, causing the internal political instability, multitude of internal political events, increase of the inter-national tension, prominent international insecurity); 4. economic (description: substantial economic detriments and endangered financial and material resources, disruption of the regular traffic system, necessity of important material expenses and compensation and fund raising, necessity of using a large quantity of techniques for preventing situations and eliminating consequences); 5. organizational-managerial (description: unpredictable situations, complexity of the prognosis of the course of event and selection of solutions, necessity of securing big quantities of different expertise and organizations, unpredictability of the scale of evacuation and rescue services).[15] It can be concluded from the mentioned description of criteria that the intensity as a main feature of emergency situations is implicitly represented through the features such as: "the speed of emergency development, mass destruction of the cattle fund, use of the considerable quantity of natural resources, big adversity, great hazard, considerable economic detriments and disruption of financial and material resources, necessity of substantial material expenses and compensations and fund raising, necessity of using a large quantity of techniques for preventing situations and eliminating consequences, necessity of securing big quantities of various expertise and organizations", which is mentioned in the descriptive features of certain criteria.

Classification of emergency situations that has been derived on the basis of the intensity criterion is mainly of theory character, rather than of pragmatic-teleological (useful-targeted) character. It enables a classification of emergency situations in a way that satisfies theory requirements concerning validity of historicity and structurality of classification criteria, on one hand, and an appropriate intensity of engagement of protection and rescue forces depending on the intensity of the emergency situation, on the other hand. However, the intensity is not a sufficient criteria for the classification of emergency situations, as, for example, a 10 Richter's degree earthquake in an unsettled area is more intense than the eight degree earthquake in a (densely) populated area. It means that the consequence criterion should be added to the intensity criterion. This leads to a complex typology of emergency situations which represents a more valid classifying method of this complex subject of division.[16]

Purely pragmatic-teleological classification criteria and therefore the division of emergency situations as a whole include those divisions that have been derived from the criterion of penetration of the territory encompassed by the emergency situation. Such classifications include classifications that contain the members: local, municipal, regional, national, federal, inter-state and global – transnational[17], i.e. derived by the criterion of the size of the emergency situation: level I – object, facility; level II – object, facility, compound; level III – (level of the local self-government unit); level IV – national level; level V – international level.[18] Such classifications are similar to the classifications of documents, i.e. administrative acts as a whole, where their archiving, use, distribution, etc. have been made possible.

In order to be able to compare the existing and proposed classification criteria (typologization) of emergency situations, the historical-structural comparison framework must be previously determined. Considering the *historicity* as a unique approach and method of research, essential features of the occurrence and development of emergency situations have been provided. The synthesis of conclusions made by means of the research of historicity of emergency situations, makes possible the expression of various manifestations (reflections) of his generic features by using appropriate classification criteria (typologization). Thus the requirements of *historicity of selected criteria*, as the constituents of classification of emergency situations have been met.

A generic feature of emergency situations is the so called "hazard trigger", i.e. the *cause* which leads to the hazards and which is used as a criterion of their classification. Namely, the Center for Research on the Epidemiology of Disasters (CRED) has been striving for years for adoption of international definitions and classifications of emergency situations.[19] In 2006, by using analytical considerations of

15 Jakovljević, V: *The importance of the conflict against emergency situations,* International scientific meeting "Emergency situations", published in the Collection of works from the international scientific conference on civil planning, 28/29. January 2009; Organizer – Ministry of Defence – Belgrade: 2009, pp. 20-28.

16 Mentioned typology is given in the table No. 2 of this paper.

17 Чрезвычайных ситуациях, http://ru.wikipedia.org/wiki/:Чрезвычайных_ситуациях.

18 *Guidelines concerning the methodology for the making of the assessment of hazards and protection and rescue plans in emergency situations,* „Official Gazette of RS", number 96/12.

19 Center for Research on the Epidemiology of Disasters, The OFDA/CRED International Disasters Database, available at: www.cred.be/emdat/disdat2.htm (accessed January 2003).

defined and selected sets of data on natural emergency situations and their impact, the Center started a huge activity in the field of making conclusions on the international classification of emergency situations.[20] A great contribution and result in the area of international classification of emergency situations has been achieved in the mutual cooperation of this organization and the MÜNICHRE. As a result of their cooperation, the joint classification has been made and established through several technical meetings that gathered together the CRED, MünichRe (Münchener Rückversicherungs-Gesellschaft Aktiengesellschaft in München), SwissRe (Swiss Reinsurance Company), ADRC (Asian Disaster Reduction Center) and UNDP (United Nations Development Programme). This is at the same time the first step in the development of the standardized international classification of emergency situations. Standardized classification that has been made at the mentioned technical meetings distinguishes two different generic categories: natural (can not be caused by human beings) and technological emergency situations (can be caused by human beings, deliberately or accidentally). The same criterion is used for classification of emergency situations by the International federation of Red Cross and Red Crescent, as follows: hurricanes, tornadoes, typhoons, droughts, earthquakes, epidemics, food privation (famine), floods, man-made emergency situations, migrations of population, volcanic eruptions and technological catastrophes; World Health Organization (natural and technological)[21], Federal Emergency Management Agency (FEMA) – natural and technological[22]; Damon Coppola in his book *Introduction to International Disaster Mangment* – natural, technological and international, civil and political emergency situations – terrorism, crime and war[23]; Canadian database on emergency situations (available at the address www.ocipep.gc.ca/disaster/search.asp) – biological emergency situations, such as epidemics, geophysical, such as earthquakes, meteorological and hydrological, such as droughts, emergency situations caused by human conflicts, such as terrorism, technological emergency situations, such as outflow of chemical matters,[24] database on emergency situations (available at the address www.ocipep.gc.ca/disaster/search.asp) of the University of Richmond – emergency situations caused by conflicts, such as bombing, terrorist acts, emergency situations caused by failures of human systems, such as pulling down of damps, natural emergency situations, such as earthquake, Ibrahim Mohamed Shaluf – natural emergency situations caused by men and hybrid–combined emergency situations,[25] Hood – purely natural, social and hybrid emergency situations,[26] Richardson – socio-technological,[27] Malaysian National Safety Council;[28] in the Russian lecturing books (conflict and non-conflict),[29] Mikhail, Paenko and Suldin: technical-technological (technogenic); 2. natural and 3. environmental,[30] in the German bibliography: social, economic emergency situations, emergencies, technical – biological – medical emergency situations and emergency situations caused by the mechanical or thermal energy,[31] in the Chinese literature: astronomic, meteorological, geological, geophysical, hydrological, biological, environmental emergency situa-

20 The organization had a clear objective that consisted of the comprehensive overview of global initiatives following the formation of emergency databases, in order to record similarities and differences when defining and classifying emergency situations. All the states possess certain databases which contain records of various catastrophic events. The problem lies in the fact that national databases are different for the reason of classifying emergency situations into various categories. They occur due to different 1. terminology, and 2. classification. Thus, for example, in one national database, a certain emergency belongs to the natural disasters, while in the other national database, this emergency is classified in the category of social hazards.

21 World Health Organization: *Emergency and humanitarian action: natural disaster profile*, available at: www.who.int/disasters/.

22 Federal Emergency Management Agency: Hazards, available at: www.fema.gov/ hazards/earthquakes/.

23 Coppola, D: *Introduction to International Disaster Management*, Elsevier, Oxford, 2007, 130-140.

24 Kourosh, E, Richard, L: Disasters: lessons from the past 105 years, *Disaster Prevention and Management*, Vol. 17 Iss: 1, 2008, pp. 62 – 82.

25 Shaluf, M.: Disaster types, *Disaster Prevention and Management,* Vol. 16, Iss: 5, 2007, pp. 704-717.

26 Rautela, P: Redefining disaster: need for managing accidents as disasters, *Disaster Prevention and Management*, Vol. 15, Iss: 5, 2006, pp. 799-809.

27 Shaluf, M, Ahmadun, F.: Disasters types in Malaysia: an overview. Disaster Prevention and Management, Vol. 15, Iss: 2, 2006, pp.286-298.

28 Malaysian National Security Council. *Directive 20: policy and mechanism of national disaster management and relief*, available at: www.adrc.or.jp/nations/nationinformatioa asp?NationCode = 458&lang = (accessed January 2003).

29 Безопасность жизнедеятельности: Учебник для вузов, 2-е изд. / Под ред. Михайлова Л А. — СПб.: Питер, 2008.

30 Михалов, А.А., Паенко, Н.И., Сулдин, И., Классификация чрезвичайных ситуаций, в Проблемы безопасности при чрезвичайных ситуациях, ВИНИТИ, Москва, 1991, стр. 24-47.

31 Schenk, G.J; Engels, J. I. (Hrsg.): Historical Disaster Research. Concepts, Methods and Case Studies „Disaster"/ Historische Katastrophenforschung. Begriffe, Konzepte und Fallbeispiele. In: Historical Social Research/Historische Sozialforschung. 32, Nr. 3, 2007 (Sonderausgabe).

tions, fires, road accidents, explosions, emergency situations concerning collapsing-destruction of buildings, emergency situations at work stations, emergency situations in terms of health, emergency situations in the mines, scientific and technological emergency situations[32], in the Dutch literature: natural, anthropogenic, cultural and humanitarian,[33] and in the Republic of Serbia: natural disasters, technical-technological accidents – incidents, consequences of war activities and consequences of terrorist acts,[34] i.e.: earthquake, rockslide, landslide, erosion, flood, storm wind, blizzard, hail, drift, glaze, drought, epidemics, epizootia, fires and explosions, technical-technological incidents and terrorist attacks, nuclear or radiation accidents.[35]

Structurality of classification criteria (typologization) contributes to the selected division principle in such a way that it makes it an expression of an essential, structural feature of emergency situations. Therefore, the following question is asked: "Is the intensity of emergency situations a structural criterion of their division?" The intensity relates to the strength, i.e. energy that is developed within a time unit. This strength is rolled out depending on the structure, i.e. the processes (natural, technical or social, dependent or independent on people, caused deliberately or accidentally, etc.) that are going on within or in relation with this strength, having an emergency situation as a consequence.

On the other hand, among the criteria discussed so far, the structural principle of division is the one that is expressed as a time principle (the more energy is developed over a shorter period of time, the higher is intensity of an emergency situation and response), i.e. as an organizational-managerial principle. Namely, the rescue organization and its management have their own structure, both in the structuralist and post-structuralist sense.

As it has been just mentioned, the structure of the subject to division (in this case of emergency situations) can be considered from the post-structuralistic point of view, i.e. *as a process*. By analyzing the subject of division viewed as a process, a conclusion is made (conditionally, i.e. when possible) that its structure represents a range of technologically dependent phases. In other words, each phase of the mentioned process constitutes a unique structural feature and can be transformed into a criterion, i.e. a principle of division of emergency situations. For example, in relation to the predictability, emergency situations can be divided into situations that can and can not be predicted (emergency situations, their conditions, likelihood of occurrence of certain conditions, effects, and expectations, can or can not be predicted). According to the *conditions* in which they occur, they can be divided into those characterized by surety, risk and uncertainty.

One of the similar classifications of emergency situations is particularly important as it actually represents a complex typology. The mentioned typology has been derived by intercrossing criteria of 1) predictability and 2) possibility of impact on an emergency situation.[36] Both mentioned criteria are of historical-structural type, as they incur from the conditions of occurrence and development of an emergency, on one hand, and the possibility of the regulatory (managerial) influence on it, on the other hand.

Apart from the post-structural approach to the research of the structure of emergency situations, the implementation of a comparative approach is also possible. Namely, by comparing the structure of emergency situations with a similar structure, some other suitable principles of division can be singled out. Therefore, a comparative approach can lead to the same structure of emergency situations as it is the case of the post-structural approach. This is the case with already mentioned comparison of the types of emergency situations derived by means of the criteria of *condition* in which they occur.

After the mentioned recording and comparison of criteria for classification of emergency situations have been done, the same procedure is conducted with the related criteria of similar classifications (typologizations). Namely, similar objects of division have similar characteristics expressed by appropriate criteria for their classification. Division criteria are obtained by the transformation of attributes used for the expression of essential features of the subject of division.

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32 Coppola, D.: *Introduction to international disaster management*. Oxford: Elsevier, 2007., str 178.
33 Quarantelli, L.: *What is a Disaster*? New York: Routledge, 1998., str. 58 – 63/
34 Article 1, *Law on Emergency Situations*, "Official Gazette of RS", Number 111/09, 92/11 and 93/2012.
35 *Guidelines concerning the methodology for the making of the assessment of hazards and protection and rescue plans in emergency situations,* „Official Gazette of RS", number 96/12.
36 Kesetovic, Ž„: *Crisis management*: Official Gazette/Faculty of Security, Belgrade, 2008.

The essence of these features of emergency situations can be of quantitative, qualitative and quantitative-qualitative (mixed) nature. The features of the quantitative nature indicate the number (for example, division of emergency situations according to the number of casualties, the amount of material damage, etc.), frequency (most often – earthquakes, road accidents; very often – fires; hazards with a moderate frequency – accidents of communal systems, volcanoes; rarest – epidemics, large scale environmental accidents),[37] intensities (already mentioned), duration (for example, explosive and gradual)[38], i.e. short-term, mid-term and long-term or their permanent, occasional and temporary (single) manifestations and other features, are taken as criteria. Qualitative features indicate the quality, as the essential characteristic of emergency situations (types of consequences, for example, permanent consequences detrimental to lives and health of the population, material damage, damage to flora and fauna, and the environment as a whole). Qualitative-quantitative criteria represent the features of emergency situations that are used to denote their features where the quantity means quality at the same time, or turns into it (for example, when the intensity of an emergency situation is transferred into certain types of its consequences).

IDENTIFICATION OF MEMBERS OF EMERGENCY CLASSIFICATION

The third part of this work relates to the "identification of the members of division" of the classification of emergency situations where the validity of considered classifications is being checked in the domain of their members. Requirements relating to the validity of *members of division* are: consistency, completeness, exhaustiveness, non-interference and discriminativity.

This part of work generally deals with the following questions: 1) thesis, 2) antithesis, 3) synthesis, etc. The number of questions of this part of research relating to the classification of emergency situations depends on the number of division members (types of emergency situations), that can be a dichotomy (dichotomous – double)[39], trichotomy (trichotomous – triple), etc.

By identifying the first member of the division (for example, the one relating to the thesis), the hypothesis containing the statement about its similarities and differences with regard to the subject of division and other members of the classification of emergency situations is partly verified. Moreover, the member that is most often in question is the one relating to the natural emergency situations that occurred on the basis of the criterion of cause. Identification of the second member of classification relates to the antithesis, which is a naturally caused emergency situation in the case of previous classification. In this particular case, the synthesis relates to the combined, i.e. hybrid emergency situations.

In order to determine the indicators more precisely, it is possible to divide each member of the classification according to the consistency requirement, to other (sub)members, which leads to the creation of the *classification system* made of several levels of generality (in the relation: general – particular – individual). For example, according to Ibrahim Mohamed Shaluf, emergency situations can be classified as follows:

• Natural: *natural phenomena beneath the earth surface* (earthquake, tsunami, volcanic eruptions); *natural phenomena of the complex physical origin at the earth surface* (rockslides, avalanches), *meteorological-hydrological phenomena* (storms, cyclones, typhoons, hurricanes, tornadoes, hail and snow storms, sea bursts, floods, droughts, heat waves/cold waves) and *biological phenomena* (overruns – swarms of grasshoppers and bugs, epidemics or infectious diseases – cholera, dengue, Ebola, pox, meningitis, malaria, yellow fever, AIDS, SARS, bird flu);

• Man-made emergency situations: socio-technical emergency situations – *technological* (fire, poison release, collapse-destruction of buildings, material property), *explosions* (chemical, nuclear and mine munitions), *pollutions (*sour rains, chemical pollutions, atmospheric pollutions), *transport*

37 Чрезвычайных ситуациях, http://ru.wikipedia.org/wiki/:Чрезвычайных_ ситуациях.

38 *Безопасность жизнедеятельности . Защита населения и территорий в чрезвычайных ситуациях* : учебное пособие по дисциплине региональной составляющей специальности «Менеджмент организации» / [Я. Д. Вишняков и др.]. - 3-е изд., испр. - Москва : Академия, 2008. – 297с.

39 Shaluf. M. I: "Disaster types", Disaster Prevention and Management, Vol. 16, Iss: 5, 2007, pp. 704 -717.

related emergency situations (air, road, rail and emergency situations at the sea and internal navigable roads), *emergency situations at stadiums and public places* (fire, collapse of civil engineering, stampede of big groups of people), *production* (failure of computer systems, distribution of faulty goods), *wars* – conventional (war between two armies of different countries, riots, blockades), unconventional (nuclear, chemical, radiological and biological wars);

• Hybrid – combined (they are the result of the combination of human error and natural forces): floods that devastate a community located at the known navigable plain, location of settlements, factories, etc. at the foot of active volcanoes or in the areas of snow drifts.

By verifying each of the members of the classification of the system of emergency situations at lower levels of generality, conditions for verification of more general members (types of emergency situations) than those already verified are being provided. Therefore, the mentioned verification of hypotheses of the classifying contents, relating to the validity of concrete divisions, is implemented in an inductive way. Complete verification of such members (types) of classification of emergency situations occurs with the comparison in relation to the logical classifying requirements.[40]

The criterion used for the derivation of the thesis is also used for the derivation of antithesis. Apart from that, all that has been mentioned for the verification of the thesis relates to the verification of the antithesis, synthesis, etc. In order to do that, a proposed classification of emergency situations should be compared with the classification validity requirements, i.e. in relation to the: *consistency, completeness, exhaustiveness, non-interference of members and discriminativity.*

If the criterion of classification of emergency situations is the *cause* of their occurrence, then they are divided into natural, man-made and hybrid – combined emergency situations. Similar to this are the divisions containing: natural, technical and combined emergency situations, then: man-made emergency situations, occurred independently on people and combined; further on: natural, technological and international, civil and political emergency situations – terrorism, crime and war, i.e.: purely natural, social and hybrid and socio-technological, and finally: emergency situations caused by conflicts, emergency situations caused by the failures of human systems and natural disasters. Mentioned members of classification of emergency situations have been derived in a consistent manner, as each of them express the cause of their occurrence. All the classifications are complete as they contain the thesis, antithesis and synthesis, with the exception of the last one that does not contain the synthesis. Each of the mentioned classifications is exhaustive as it does not contain residual groups of members, such as: etc, and other. Mentioned classifications contain the members that do not interfere, i.e. are mutually exclusive. Finally, the members of the mentioned classifications are discriminative, i.e. they are theoretically mutually indented sufficiently enough to represent special types of emergency situations.

Classification of emergency situations used for the division of: biological, geophysical, meteorological and hydrological, emergency situations caused by human conflicts and technological emergency situations are also derived in a consistent manner, by using the criterion of cause. They are also complete as they basically contain the thesis – natural emergency situations (biological, geophysical, meteorological and hydrological), antithesis – emergency situations caused by the human action and synthesis – technological emergency situations (action of the natural and human factor).

The Malaysian national security council divides emergency situations into: natural, industrious, incidents that include: transport, supply and disposal of hazardous materials, collapse-destruction of multi-store buildings and special structures, plane crashes, crashes of trains and derailment, fire that encompasses a large area or high buildings or any other special structure with plenty of people inside, damage of power-plants or reservoirs, nuclear and radiological accidents that involve nuclear alloys or radioactive agents where the incident could extend and cause losses of human lives, damage to property or environmental pollution having an impact on local activities, release of the poisonous gas in a public area and mist-haze. This division has the elements of consistency in relation to the criterion of cause. However, its completeness is disputable as it does not contain all the modes of transport (only air and rail transports are present). The exhaustiveness of the classification has also been satisfied. Achieving the criteria of non-interference of members and discriminativity is not disputable either.

40 By using the feedback, deductive method, the conclusion regarding the validity of the members (types) of the most valid classification of emergency situations also relates to the domain of all the members that have been contained therein.

As it has been already indicated, the Russian learning books contain the division of emergency situations, they being conflict and non-conflict situations. This classification is dichotomous, as it contains the thesis and antithesis; it is consistent, complete, exhaustive, but has not an interference of the members and is discriminative.

A very important classification is of the same origin and relates to:

• The character of hazard – actually the cause of the emergency situation: technical, biological, natural, environmental and social character;

• The frequency rate (most often – earthquakes, transport accidents; very often – fires; hazards of medium frequency – accidents of communal systems, volcanoes; rarest: epidemics, large scale environmental accidents);

• Encompassed territory (local, municipal, regional, national, federal, inter-state and global – transnational).

The first classification is consistent, complete, exhaustive, but the members interfere and it is not discriminative. Namely, naturally caused emergency situations are the ones of environmental, i.e. biological character. The second classification (derived by means of the frequency rate) is consistent, incomplete, exhaustive, the members do not interfere and is discriminative. Namely, the division of emergency situations per frequency rate that contain the members such as: most often, very frequent; hazards with medium frequency and the rarest, lack rare emergency situations. Finally, according to the encompassed territory, a classification is derived and is constituent, complete, exhaustive, its members do not interfere and is discriminative.

The next classification, also of Russian origin, contains emergency situations that are divided into: technical-technological (technogenic); 2) natural and 3) environmental. All the members of the classification have been made by the implementation of the criterion of cause, which means that the classification is consistent. Also, it could be concluded that the classification is completely exhaustive. However, the interference of the members relating to the natural and environmental emergency situations is quite certain. This is at the same time the reason of its non-discriminativity. Such divisions can be precisely stated, by developing a classification system which would offer additional improvement in terms of non-interference of the members and their mutual discriminativity.[41]

Classification of emergency situations is present in the German literature and this classification contains the following types: social, economic emergency situations, emergency situations of technical-technological-biological-medical nature and emergency situations caused by the mechanical and thermal energy. This classification has been consistently and completely derived, however, likewise the previous classification, the interference of members and discriminativity have not been provided (social and economic emergency situations are mixed up, without being sufficiently theoretically indented). The recommendation concerning its improvement is identical to the one that relates to the previous classification.[42]

The Chinese literature avail of the division that relates to the: astronomic, meteorological, geological, geophysical, hydrological, biological emergency situations in the environment, fires, road accidents, explosions, emergency situations in relation to the collapse-destruction of buildings, emergency situations at work stations, emergency situations related to health issues, emergency situations in mines, scientific and technological emergency situations. This division of emergency situations has not been consistently derived, as all the members do not indicate the cause of the emergency situation, but only the location of its occurrence (emergency situations at work stations, i.e. emergency situations in mines). This classification is exhaustive as it does not contain residual groups. It contains the interference of the members (for example, emergency situations at work stations and emergency situations in mines, as the mine is the work place of miners, to which fires and explosions can be associated as well, as they can also occur at work stations and in mines). They are not discriminative, i.e. theoretically indented to a sufficient extent. Accordingly, this classification is not theoretically valid.[43]

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41 Безопасность жизнедеятельности . Защита населения и территорий в чрезвычайных ситуациях : учебное пособие по дисциплине региональной составляющей специальности "Менеджмент организации" / [Я. Д. Вишняков и др.]. - 3-е изд., испр. - Москва : Академия, 2008.

42 Gerrit Jasper Schenk, Jens Ivo Engels (Hrsg.): Historical Disaster Research. Concepts, Methods and Case Studies „Disaster"/Historische Katastrophenforschung. Begriffe, Konzepte und Fallbeispiele. In: Historical Social Research/ Historische Sozialforschung. 32, Nr. 3, 2007 (Sonderausgabe).

43 Downloaded from the internet address: http://zhidao.baidu.com/question/97098818.html
http://baike.baidu.com/picview/98783/98783/0/9213b07eca806538fa4fe39697dda144ac34828a.html,_

Classification of emergency situations is present in the Dutch literature and contains: natural, anthropogenic, cultural and humanitarian emergency situations. This classification has not been consistently derived as the cultural and humanitarian emergency situations are derived from the criterion of consequence, but not from the criterion of cause. The classification itself is not complete, as it has not been expressed by the thesis-antithesis-synthesis logic. Finally, the classification is exhaustive, but not immune to the interference of the members (anthropogenic, cultural and humanitarian members interfere), nor it is discriminative.[44]

The division of emergency situations in the Republic of Serbia relates to the nature of their occurrence: natural disasters, technical-technological accidents – incidents, consequences of war actions and consequences of terrorist acts,[45] i.e.: earthquakes, rockslides, landslides and erosions, floods, stormy winds, hail, blizzards, snow drifts and glaze, drought, epidemics, epizootia; fires and explosions, technical-technological accidents and terrorist attacks and nuclear or radiation accidents.[46] These classifications have been consistently derived; they are complete, exhaustive, provide no interference of members and are discriminative.

The division of emergency situations according to the size[47] is as follows: level I – object, facility; level II – object, facility, compound; level III – (level of the local self-government unit); level IV – national level; level V – international level. According to the consequences on people, animals, economy and environmental protection, socio-political situation, emergency situations are divided into[48]: minimum, small, medium, severe, catastrophic. Likewise previous divisions, the abovementioned divisions of emergency situations have been consistently derived and they are complete, exhaustive, provide no interference of the members and are discriminative.

Apart from the classifications of doctrinary type that are prescribed in the law and by-laws of the Republic of Serbia, classifications of emergency situations in theoretical literature are also present. One of them is of particular interest as it actually represents a complex typology of emergency situations. The typology in question has been derived by the intercrossing of predictability criteria and possibility of influence on an emergency situation (the following table).

Table 3: Complex typology of emergency situations

		Possibility of influence on an emergency situation	
		Manageable	Non-manageable
Predictability	Predictable	Conventional emergency situation	Non-manageable emergency situation
	Unpredictable	Unexpected emergency situation	Fundamental emergency situation

In that sense, the following types of emergency situations are distinguished:[49]

• Conventional emergency situations (they are predictable and possibilities of influencing them are well known),

• Unexpected emergency situation (characterized by the possibility to have an influence on them, though being hardly predictable),

• Non-manageable emergency situation (they can be predicted successfully, but the influence on them is already impossible due to the characteristics of the system in question, which makes the re-

44 Downloaded from the internet address:http://nl.wikipedia.org/wiki/Ramp – the Netherlands
45 Article 1 of the *Law on Emergency Situations*, "Official Gazette of RS", No 111/09 and 92/11 and 93/2012.
46 *Guidelines concerning the methodology for the making of the assessment of hazards and protection and rescue plans in emergency situations,* "Official Gazette of RS", number 96/12.
47 Ibid.
48 Ibid.
49 Kesetovic, Z: Crisis management: Official Gazette/Faculty of Security, Belgrade, 2008.

sponse difficult, as well as the preparedness for the emergency situation; or due to the conflict of interests surrounding the system that prevents the implementation of proactive countermeasures and

• Fundamental emergency situation (represents the most dangerous type of extraordinary situations because they are unpredictable and it is not possible or hardly possible to have an influence of them).

Mentioned typology of emergency situations has been consistently derived and it is complete, exhaustive, provides no interference of the members and is discriminative.

CONCLUSION

The prerequisite for the classification of emergency situations is an unequivocal determination of the mentioned subject of division. A newly created or analyzed classification of emergency situations should satisfy the conditions of the valid classification relating to the theory and logical requirements. According to this, validity requirements for classification relate to the criteria, on one hand, and to the members of division, on the other hand.

Theoretical research of the *classification of emergency situations* that has been performed by the analysis of various specialized materials published in Serbia and around the world represents an attempt of a modest contribution to the identification of the universally accepted classification of emergency situations. More concretely, during the research, a large number of various definitions and classifications of emergency situations has been processed, despite the authors' being aware that some of the translations have not been done in the most professional way, in an appropriate context, etc. Therefore, we are of the opinion that it will be worth elaborating some of the conclusions we have reached.

Each emergency and its characreristics has its own causes of occurence, unique scenario, influence on human beings and environment, scales and severity of consequences. It implies that emergency situations can be classified on the basis of numerous features that take into consideration these complex occurrences from different points of view. However, differences between the classifications are a consequence of different definitions of emergency situations as a subject to division. One of the reasons for that is that authors have translated foreign terms literally and without criticism (disaster, catastrophe, emergency) and connect them with our terms, such as emergency situation, catastrophe, crisis, state of emergency. Besides, numerous definitions of emergency situations may have a national or culturological feature which makes difficult the standardization of the mentioned term. As far as the international classification is concerned, the most accepted and most cited is the classification of emergency situations offered by CRED, i.e. the organization for research of epidemiological disasters that has been longing for years to adopt the international definitions and classifications of emergency situations. All this has as a consequence the fact that numerous classifications of emergency situations express specificities of their countries of origin.

Although intensive efforts have been made by the international organizations, state bodies and organizations, as well as by individuals to accept their proposed classifications of emergency situations as universal, the mentioned classifications of various authors, organizations and institutions around the world unambiguously testify that this has not yet happened. Therefore, we can say that there is no accepted (adopted) and universal classification of emergency situations.

Generally speaking, all emergency situations can be classified in three framework types: natural emergency situations, emergency situations that are related (directly or indirectly) to the human beings (they are called anthropogenic, technological, technical-technological, social) and hybrid emergency situations (combination of acts of natural forces and the influence of human decisions). Therefore, the mentioned classifications have been derived by means of the criterion of cause that has a generic-structural characteristic, i.e. it fulfills logical requirements of classification. The common feature of all emergency situations regardless of the type is related to their consequences. By combining the criteria of cause and consequence, intensity and consequences, etc. valid complex typologies are being obtained. Besides, emergency situations are divided into groups, sub-groups and incidents, i.e. the so called "classifying systems".

When making a classification of emergency situations, researchers, organizations and institutions use various criteria, some of which have a theoretical or pragmatic-teleological importance. Therefore, understanding of definitions and classifications of emergency situations serve to the researchers and organizations around the world as a good platform for research, database managing, better analysis of them all and practical implementation of derived conclusions.

REFERENCES

[1]. Alavi, A, Hu, P, Deutsch, T, Silvestrelli, P.L. and Hutter, J: CO Oxidation on Pt(111): An Ab Initio Density Functional Theory Study, *Phys. Rev. Lett*., 80 (1998) 3650-3653.

[2]. Center for Research on the Epidemiology of Disasters, The OFDA/CRED International Disasters Database, available at: www.cred.be/emdat/disdat2.htm (accessed January 2003).

[3]. Coppola, D.: *Introduction to international disaster management*. Oxford: Elsevier, 2007., str 178.

[4]. Črezvыčajnыh situaciяh, http://ru.wikipedia.org/wiki/:Črezvыčajnыh_ situaciяh.

[5]. Gad-el-Hack, M.: Facets and scope of large-scale disasters. Natural Hazards Review 11 (1), (2010): 1–6.

[6]. Federal Emergency Management Agency: Hazards, available at: www.fema.gov/ hazards/earthquakes/.

[7]. Fitzgerald J.D, Fox M.S: Methodology of Research in Criminalistic Science, translated from English Bakic, I., Muratbegovic, E. (2001). Sarajevo: Faculty of Criminalistic Science.

[8]. Kourosh, E, Richard, L: Disasters: lessons from the past 105 years, *Disaster Prevention and Management*, Vol. 17 Iss: 1, 2008, pp. 62 – 82.

[9]. Lukic T., Gavrilov M., Markovic S., Mladjan D., Djordjevic J., Jovic V., Janicevic S. "Classification of Natural Disasters between the legislation and Application: Experience of the Reepublic of Serbia" International Conference „Natural hazards-Lessons from the past, prevention, and prediction". University of Novi Sad / Faculty of Science-Department of Geography, Novi Sad, 2012.,05 th May, Abstract book, p. 40.,

[10]. Malaysian National Security Council. *Directive 20: policy and mechanism of national disaster management and relief*, available at: www.adrc.or.jp/nations/nationinformatioa asp?NationCode = 458&lang = (accessed January 2003).

[11]. Shaluf, M,.: Disaster types, Disaster Prevention and Management, Vol. 16, Iss: 5, 2007, pp. 704-717.

[12]. Shaluf, M, Ahmadun, F,: Disaster types in Malaysia: an overview, Disaster Prevention and Management, Vol. 15, Iss: 2, 2006, pp. 286–298.

[13]. Shaluf, M: An overview on disasters, Disaster Prevention and Management, Vol. 16

[14]. Iss: 5, 2007, pp. 687 – 703.

[15]. Shaluf, M,: An overview on the technological disasters, Disaster Prevention and Management, Vol. 16 Iss: 3, 2007, pp. 380 – 390.

[16]. Quarantelli, E.L. (1985) Social support system: some behavioral patterns in the context of mass evacuation activities. In Disasters and Mental Health: Selected Contemporary Perspectives (ed. B. Sowder). Rockville, MD: National Institute of Mental Health, pp. 122–136.

[17]. Quarantelli,E. L.: What is a disaster. New York: Routledge, 1998., str. 58 – 63/

[18]. Quarantelli, E.L. (2006) Emergencies, Disasters, and Catastrophes are Different Phenomena. http://www.udel.edu/DRC/preliminary/pp304.pdf (accessed January 31, 2006).

[19]. Rautela, P: Redefining disaster: need for managing accidents as disasters, *Disaster Prevention and Management*, Vol. 15, Iss: 5, 2006, pp. 799-809.

[20]. Schenk, G.J; Engels, J. I. (Hrsg.): Historical Disaster Research. Concepts, Methods and Case Studies „Disaster"/Historische Katastrophenforschung. Begriffe, Konzepte und Fallbeispiele. In: Historical Social Research/Historische Sozialforschung. 32, Nr. 3, 2007 (Sonderausgabe).

[21]. World Health Organization: *Emergency and humanitarian action: natural disaster profile*, available at: www.who.int/disasters/.

[22]. Безопасность жизнедеятельности. *Защита населения и территорий в чрезвычайных ситуациях : учебное пособие по дисциплине региональной составляющей специальности* «Менеджмент организации» / [Я. Д. Вишняков и др.]. - 3-е изд., испр. - Москва : Академия, 2008.

[23]. Безопасность жизнедеятельности: Учебник для вузов, 2-е изд. / Под ред. Михайлова Л А. — СПб.: Питер, 2008.

[24]. Vujaklija M. (1996). Thesaurus of foreign word and terms. Belgrade: Institution of Education.

[25]. The low of emergency situation. Official journal of Republic Serbia, nos. 111/2009 and 92/2011.

[26]. Kesetovic, Ž. (2008). Crisis management. Official journal of Republic Serbia. Belgrade: Faculty of Security, Београд.

[27]. McEntire, D.A.:Disaster Response and Recovery: Strategies and Tactics for Resilience.Hoboken, (2007) NJ: John Wiley & Sons, Inc.

[28]. Михалов, А.А., Паенко, Н.И., Сулдин, И., *Классификация чрезвичайных ситуаций*, в Проблемы безопасности при чрезвичайных ситуациях, ВИНИТИ, Москва, 1991, стр. 24-47.

[29]. Mladjan, D., Kekic, D., Subosic, D. (2009). Some aspects of natural, technological and social security in modern world. Books of international scientific conferences about civil planning in Belgrade, The Ministry of Defense. 2009, pp. 342-351

[30]. Основы защиты населения и территорий в кризисных ситуациях / Под общ. ред. Ю.Л. Воробьева. МЧС России. М.: Деловой экспресс, 2006.

[31]. Paul, B: Environmental Hazards and Disasters: Contexts, Perspectives and Management focuses; Publisher: Wiley; 1 edition (2011), 334 p

[32]. Subosic, D. (2009). Research of contents in security studies. Military Journal of Serbia. стр. 227-241.

[33]. Guidelines of the methodology for the development of risk assessment and plans for protection and rescue in emergency situations, «Official Journal, PC", број 96/12.

[34]. Федеральный закон РФ от 21.12.1994 N 68-ФЗ (ред. от 01.04.2012) „О защите населения и территорий от чрезвычайных ситуаций природного и техногеног характера".

[35]. http://zhidao.baidu.com/question/97098818.html i http://baike.baidu.com/picview/98783/98783/0/9213b07eca806538fa4fe39697dda144ac34828a.html,

[36]. http://nl.wikipedia.org/wiki/Ramp – Holandija

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DEVELOPMENT AND THE FUTURE OF SECURITY SCIENCES IN THE REPUBLIC OF SERBIA[1]

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ABSTRACT: As an autonomous and integral corpus of several types and groups of scientific disciplines, Security Studies are being studied and researched at many higher-educational and research institutions at home and abroad. Some of them are specialized exclusively for education and research in the field of security. At the same time, this scientific field has its practical application and it is based on certain practice. However, the Security Sciences are among the "young" sciences, and domestic science-educational system did not officially declare it as an independent scientific field. This is not a methodological problem (nor logical, gnoseological or epistemological), given the fact that all disciplines of security orientation have their own independent system of scientific knowledge, which means they have their unique subject, theory, method and language. The nature of the problem is primarily commercial, so the powerful lobbying circles do not allow the Security Sciences (according to the norms prescribed by the highest national authorities in the field of science and education) to be declared independent and integrated scientific field, from which special education profiles and professions can be derived. Instead, Security Sciences are presented as one of the (sub) areas of other scientific corps, mostly military, political, legal, criminological and criminalistic sciences. In that sense, the subject of this paper is emphasizing science constituents of the Security Sciences while the goal of the paper is to develop the academic community's the awareness of the necessity of the normative declaring of Security Sciences as a particular scientific field.

Keywords: security, scientific research activity, higher education, the field of security studies, the Republic of Serbia.

INTRODUCTION

The security sciences belong to a group of new-born or, we could say, emerging sciences. That is one of the reasons why some of the scholars of other sciences still do not yet recognize them as a specific scientific field. Defining security sciences seems to be a hard work even for the security researchers themselves because of the complexity of what makes its content. Hence, many of the scientists writing about security often do it in a way to represent it as a particular study in the area of, for example, international relations, instead of making the efforts to develop it into an independent science. This is noticeable in the titles of some books, which do a little on promoting the idea to segregate Security as a particular scientific field, even just terminologically.[2]

Even so, security studies are studied in numerous higher education institutions in the country and abroad, which is a good way of tracing the path from security studies toward security sciences. Some of them are even specialized exclusively for education in the field of security[3], or for individual subareas of security studies.[4] It is indisputable that numerous scientific disciplines were developed

1 This work is the result of the realization of the research project entitled Development of institutional capacity, standards and procedures to counter organized crime and terrorism in the conditions of international integration. The Project is funded by the Ministry of Education and Science of the Republic of Serbia (No. 179 045), managed by the Academy for Criminalistic and Police Studies in Belgrade (2011-2014). The project leader is prof. Dr. Saša Mijalković.

2 For example: Buzan, B.: *People, States & Fear – An Agenda for International Security Studies in the Post-Cold War Era*, Lynne Rienner Publishers, Boulder - Colorado, 1991; Williams, D.P. (ed.): *Security Studies: An Introduction,* Routledge, New York and Wolverhampton, 2008; Buzan, B; Hansen, L.: *The Evolution of International Security Studies*, Cambridge University Press, New York, 2009; Hughes, W. C.; Meng, L. (eds.): *Security Studies - a reader*, Routledge, London and New York, 2011; and so on.

3 For example, the Faculty of Security Studies, University of Belgrade, Faculty of Security and Protection of Banja Luka, Faculty of Security Sciences in Ljubljana, Academy for Security and Diplomacy in Belgrade, and so on.

4 For example, the Academy for Criminalistic and Police Studies in Belgrade, Faculty of Political Science, University of Belgrade, Faculty of Law, University of Novi Sad, Faculty of Law, University of Montenegro, High School in Banja Luka, Faculty of Criminology, Criminal Justice and Security Studies in Sarajevo, Military Academy of the Serbian Army, etc..

under which the security issues were studied. Finally, the European Union has recognized the security area as an important sphere of scientific research, which has been confirmed through the funding of certain research programs (for example, FP7).[5] In addition, this scientific field has its own practical applicability, so you can say that it is one of the sciences with practical significance. At the same time, the security sciences are based on certain (security) practice, with which they are compatible.

Although there is no doubt that this is about an integral and autonomous corpus of science which consists of series of forms and groups of scientific disciplines, security sciences haven't yet been declared as an independent scientific field in the national scientific system. It should be noted that this problem is not of a methodological (logical, gnoseological or epistemological) nature, given that all disciplines of security orientation have their own independent system of scientific knowledge, or unique object, theory, method and language. The nature of this problem is primarily commercial. Namely, by denying security as a science, related scientific areas "benefit" developmentally (by flourishing of new scientific and educational backgrounds and educational institutions) and financially (education as a business, it tends to unfair competition - at the expense of their own development preventing the development of others).

Because of this, powerful lobbies do not allow the security sciences, according to norms provided by the highest national authorities in the field of science and education, to be declared as an independent and integrated scientific field, from which special education and occupational profiles could come out. Instead, security sciences are portrayed as one of the (sub) areas of other scientific corps, mostly military, political, legal, criminological and criminalistic sciences.

This situation is in collision with the fact that security is a basic and dominant scientific field in which scientific knowledge for phenomena of natural, human and technological character which have a positive or destructive effect on vital values and interests of individuals, groups, companies, countries, international community and humanity are concentrated. Therefore, the safety and labeling as integrated scientific field should be one of the prioritized joint mission of theoreticians and practitioners of security. Such efforts are also evident in the neighboring countries, where Defendology is widely practiced[6], or "asphaliology"[7] synthesized as an independent field of science.

The historical processes that underpinned the constitution of the modern concept of security have also had consequences for how security should be studied.[8] Thus, in the next chapter, the evolution of security as a scientific field is briefly presented.

EVOLUTION OF SECURITY AS A SCIENTIFIC FIELD

Even at the early stages of development of the social sciences, primarily in ancient philosophy, sociology and history, the first signs of theoretical thinking about security are revealed. The continuous quest of ancient philosophers for achievement, improvement, enjoyment, protection and defense of human values above all peace, freedom, rights, duties and responsibilities of an individual and the polis, to improve the organization and functions of the state, but also of other spheres (in) the state of life, certainly were reflected on the security.[9] The ancient, and the latter philosophers will not "teach us everything we want to know about security, but it will help us learn how to think about security, what to think and why".[10]

5 http://www.eutrainingsite.com/fp7.php?id=1&sid=1 # EUF; http://ec.europa.eu/research/fp7/index_en.cfm; http://cordis.europa.eu/ servererror/403.html? = 37.19.108.121 IP etc.., available on 19th November 2012.

6 Many theoreticians of security support the thesis that the security is actually a product of the protection and defense of the reference values, thereby demonstrating the formula Defense + protection=security and the scientific field in which everything refers to Defendology. The first books relating the field of Defendology in the Balkans have already been written: Vejnović, D., Šikman, M.: Defendology - Social Security Aspects of the Modern State, Higher School of Internal Affairs, Banja Luka, 2007 (see p. 11 and 17); Spaseski, J., Aslimovski, P. Defendology - Learning for the Safety, Protection, Defense and Peace, Faculty of Education, University "Ss. Kliment Ohridski - Bitola, Bitola, 2002; Kotovčevski, M.: National Security of the Republic of Macedonia (I, II . III), the Macedonian civilization, Skopje, 2000.

7 About the roots of security thinking, primarily through the works of Hobbes, Thucydides, Rousseau, Locke, Bentham, Hegel, Clausewitz, Smith and Descartes see also - Burke, A.: aporias of Security, Alternatives: Global, Local, Political, Vol. 27, no. 1, 2002, pp. 1-27.

8 Buzan, B., Hansen, L.: *The Evolution of International Security Studies*, Cambridge University Press, Cambridge, 2009. Pg. 32.

9 About the roots of security thinking, primarily through the works of Hobbes, Thucydides, Rousseau, Locke, Bentham, Hegel, Clausewitz, Smith and Descartes see also - Burke, A.: aporias of Security, Alternatives: Global, Local, Political, Vol. 27, no. 1, 2002, pp. 1-27.

10 Kolodziej, E. A.: *Security and International Relations*, Cambridge University Press, Cambridge, 2005, pp. 48–75.

At the same time, many elements of the theory and practice of security developed in the framework of religion.[11] Simultaneously with religion, among people was growing pseudo (pagan) practice (beliefs, magical rituals and traditions) of protection the security of the individual and the collective. Thus, in symbiosis with the (self) protective practice, security culture has been developing.

In a wider sense, the elements of the theory of security have evolved over centuries, at first within the military sciences and disciplines (primarily military skills, methods of intelligence, defense and civil protection) and, later, legal sciences (first of all, the discipline of international, constitutional, administrative and criminal law, as well as the theory of the state and law), political sciences and disciplines (primarily the political system and the science of international relations), criminological disciplines (criminal etiology, phenomenology and victimology), law enforcement disciplines (primarily law enforcement methods), organizational and management sciences etc. As time passed by, with extraction of individual funds of knowledge on the security, from mentioned scientific discipline independently - synthetic, as well as a unique disciplines and security studies have developed.[12]

In the strict sense, security sciences are regarded as emerging and developing with the rapid development of security practices during the Second World War and the so-called Cold War. Before that, the theory of security was a substrate of the so-called War studies, defensive and military strategy and geopolitics. After World War II, the so-called, Strategic Studies and Peacekeeping Studies were differentiated. They focused on the security of the state against possible military threats and the threat from weapons of mass destruction, searching for models of world peace promoting, and later the so-called economic and environmental security. Although they were still developing under the strategic studies, the period of the sixth and seventh decade of the last century, was considered as a "golden age" of security studies. They finally differentiated only by the end of the Cold War, when they developed within a number of research schools and approaches.[13] As the reference objects of protection they had the man, social groups and the planet, and the focus was expanded to a wide range of non-military threats and threats which come from non-state actors and from the environment. Since then *Security Sciences* and *Security Studies* were studied worldwide in higher education institutions, from which the future members of the security sector were primarily recruited [14]

Such a trend, although slowed down, is present in our country, too. Security sciences were studied primarily at the military academies. With the establishment of certain civilian faculties, first of all the Faculty of National Defense of the University of Belgrade and the Faculty of Security and Social Self-protection at the University of Skopje, the illusions about the fact that theory of security belong exclusivity to military schools and academies shattered. The only institution in Serbia in which security sciences are primarily studied is the Faculty of Security Studies within the University of Belgrade.

This is contributed by a number of changes in a total context of security practices in the second half, especially in the last quarter of the twentieth century: the state is no longer the only "provider" of security, there are also non-state actors and international actors as well. At the same time, the state is no longer the sole object of security, but these are also individual, social groups, the international community and humanity. Besides military threats, security has focused on many non-military threats, which cannot be dealt with only by the army. And, finally, the overall socio-economic transition (primarily of real socialist countries) was followed by the reform of the security sector.[15]

11 These are the ideas of individual and collective values, and ways needed to reach them and protect, but also on the development of certain types of security services, particularly certain ecclesiastical diplomacy and intelligence.

12 About connections of security science and some of these disciplines, more in - Stajić, Lj: Basic security system with basic security research phenomenon, Faculty of Law in Novi Sad, Novi Sad, 2008, p. 3-5.

13 More in: Simic, D R: Security science - a modern approach to the security, the Official Gazette of the FRY and the Faculty of Political Sciences, Belgrade, 2002, p 55-57; Terriff, T., Croft, S., James, L., Morgan, P. M.: Security Studies Today, Polity Press, Cambridge, 2001, p 29-114, Security Studies - An Introduction (ed. Williams, P.), Routledge, London-New York, 2008, pp 1-129 etc.

14 Buzan, B., Hansen, L.: *The Evolution of International Security Studies*, Cambridge University Press, Cambridge, 2009, pp. 1–7, 13–16.

15 See Mijalković, S.: National Security, Faculty of Criminalistic and Police Studies, Belgrade, 2011, p. 113th

The degree of expansion	Name of the concept	Method of expansion		
		Whose security?	Security of what? Value under the risk	Safety from whom or what?
without expansion	national security	State	sovereignty, territorial integrity	other states (sub-national units)
considerably downwards	societal security	nations, social groups	national unity, identity, survival	states nations, migrants, other cultures
radically downwards	Individual and Human Security	individuals, the human species	survival, quality of life	state globalization, nature
ultra-radical	Environmental Security	Ecosystem	sustainability	human species
radically and upward	international security	international regions	International Peace, international order	State, international associations and organizations
ultra-radically and upward	global security	humanity, planet	survival quality of life, environment	human species, natural and technological disasters

Table 1 - Expansion of the traditional concept of (national) security [16]

At the same time, there is a noticeable tendency of other faculties to spread the field of scientific and educational interests[17] and develop police education within the studies the security sciences are studied. In addition, security is increasingly studied in a number of private higher education institutions.

Specific disciplines of security studies have traditionally been studied within the studies at the Police College in Zemun and the Police Academy in Belgrade, while lower level of abstraction - also in high school in Sremska Kamenica. While establishing the Academy of Criminalistic and Police Studies (which taught the subject in the field of criminal justice and police and security science) in 2006, a course on the security on the bachelor academic studies and security course on the undergraduate professional studies were introduced.[18]

It is realistic to expect that security science to be studied in police education institutions and faculties of Security Studies for a long time, as well as in the security studies of other higher education institutions in the world, in which specific departments for each sub-area of security science will be probably formed a : national security, international security, protection and rescue in emergency situations and so on. This thesis is also confirmed by a real "revolution" in retraining higher education institutions for the education in the field of security.[19]

16 Downloaded (and amended) from Møller, B.: National, societal and human security - General considerations depicting the Balkan case, Human Security (ed. Dulic, d.), No. 1, Faculty of Civil Defense, Belgrade, 2003, page. 42nd

17 For example, the Faculty of Law of the University of Kragujevac - Department of Homeland Security, Faculty of Political Science of the University of Belgrade - Department of International Security and so on.

18 At the Academy exists, and as a professional structure works Department of security studies. All scientific disciplines within it are classified in specific scientific areas of security studies and security in emergency situations. First of all, these are : National Security, International Security, Phenomenology of security threats, Methods of intelligence activities, Security systems, Security in emergency situations, Endangerment of person, property and business, Terrorism and Political Violence, Intelligence and counterintelligence aspects of terrorism and counter-terrorism, Security of person and property, Prevention and suppression of fires, explosions and accidents etc.. See - Academy of Criminalistic and Police Studies, in Belgrade - 90 years of higher education in Serbia Police, Criminal Police Academy, Belgrade, 2012, p. 187-198.

19 Croft, S.: What Future for Security Studies?, *Security Studies – An Introduction* (ed. Williams, P.), Routledge, London–New York, 2008, pp. 499–511

THE EVIDENCE THAT SECURITY IS A SCIENTIFIC FIELD

Since the 1990s some Eastern European countries have been trying to constitute a Police-Security Science. One of the examples is Slovenia, precisely, the College of Police and Security Studies. They found that creation of a relative independent police security theory should pass several steps that determine the constitution of Police Security Science. These are the steps:

1) a definition of a special scientific subject which exists independently and is not researched by the other sciences,
2) a definition of an entirety system of empirical and theoretical knowledge about researching subject,
3) an elaboration of a relative entirety theory (or theories) which should be able to develop interpretative, exploitative and predictive functions of the police security science,
4) a creation of a conceptual (especially category) apparatus and professional police and security terminology, because current professional police language suffers from its uncertainty , incorrectness and from a lack of uniformity
5) a creation of an effective methodology and a system of active scientific methods, because a level of a methodology development depends on a level of theory development and on the contrary.[20]

The criteria by which the system of scientific knowledge (truthful, objective, regulated, connected, inclusive, variable, verifiable and applicable) distances itself from what is not, are the basic scientific constituents - own unique object, theory, method and language of science.

Although they rely on the knowledge and achievements of other sciences to some extent, the unique object, methods, language and theory have made the security an independent scientific field.

There are convictions that almost all issues of social and national life, as well as the appearance of the natural processes and technical systems can be considered as a subject of security disciplines. Such broadening of the security through its uncritical „securitization" of the phenomena from the outside world is scientifically unjustified and socially inappropriate. On the other hand, there are concepts by which these are only the ones that have a certain positive or negative impact on certain values and interests (the so-called, security phenomenon), to which we adhere.

In the widest sense, the subject of security sciences is the security of the individual, society, state, international community and humanity (planet), also the implementation, maintenance, enhancement and protection of their vital interests and values from a variety of threats that may occur by the effects of nature, human and technical and technological system. In fact, these are the sources, forms, and consequences and the subjects of these endangerments of values, functions, organization and systems in which society, the state and the international community, protect the already mentioned values. More specifically, each discipline has its own subject of research and study, which is special in relation to the subject of security studies (which is more general). Such defined subject in security studies is genuine, and from the above mentioned point of view, it is unique in this scientific field.[21]

The theory of security explains the development and relating principles that govern the facts, phenomena and processes that positively or negatively affect the safe and social values and national interests, directs and develops security practices, and allows evaluation and prediction of security occurrences. In this sense, the theory of security is generally composed of multiple (sub) theories - learning about science subjects in some segments of security (e.g., the theory of functions of security, security organization, security threats, security system, security management, etc.). In addition, the situation has been made more complex by multiplicity of values to which it is necessary to provide protection, which also has a number of theories (theories of individual, human, environmental, energy, social security, etc.).

20 *Constitution of Police-Security Science*, available on December, 20th, 2012, at: https://www.ncjrs.gov/policing/con93.htm
21 For example, the safety, the security, the security organization, functions of security, security system, security agents, security forces, security services, security objectives, security measures, security activities, security threats, sources of threats to security holders of security threats, endangering the vision and form of security, object of security threats, consequences of security threats, the reference values, reference interests, the challenge of security, security risk, security threat, the concepts of security, individual security, human security, societal security, national security, international security, regional security, global security, etc..

Furthermore, as a scientific field, the security has developed conceptual system of categories. The assortment consists of literary language, vocational language and concepts from the language of complementary disciplines. The security sciences have their own conceptual category tool (called *specified - vocational* language).[22] Considering that the field of security is interdisciplinary and multidisciplinary, it uses a technical terminology and language of other related disciplines and fields of study, as well as the terminology of national and international legislation and security practices.

Finally, the development of a discipline depends on the application of the scientific method to the knowledge base under consideration. A definite feature of a science is that there are a set of procedures that demonstrate how outcomes are produced, and these procedures are sufficiently detailed so that others may replicate the process to verify or refute the outcomes. Scientific method usually includes the gathering of the data, construction of the hypothesis, testing or evaluating the hypothesis and analyzing the results to see if the hypothesis is true or false.[23] Within the security studies there are generally accepted and used rules and methods of scientific research. In fact, general research methods, primarily for general logic operations of trial and conclusion, or the induction, deduction, analysis, synthesis, analogy, generalization, and the principles of formal logic (principles of identity, no contradiction, excluded middle, sufficient reason) make some scientific description, scientific classification, scientific explanations, scientific laws, scientific discoveries and potential scientific predictions possible.[24]

Then, the used methods are primarily the methods of the social sciences, because most of security phenomena are social phenomena. To a lesser extent, the methods of natural and technical sciences are also used, when it is necessary to investigate security phenomenon of that nature. More specifically, methods that are commonly used for the research of security phenomena are: insights into existing written sources (i.e. content analysis), secondary data analysis, observation (or observation with participation), tests (interviews, surveys, testing), case studies, experiments, comparative methods and so on. The essential features of the scientific method, including the one used by the security sciences are scientific-relatedness, rationality, aim, systematic approach, critical evaluation and the possibility of being under control.[25]

SCIENTIFIC RESEARCH IN THE FIELD OF SECURITY

Scientific research in the field of security has at least a dual significance: Firstly, it finds solutions for many problems of security and creates conditions for the promotion of security. Secondly, in such manner the theory of security science develops. Thus, the security is confirmed as a fundamental and also as an empirical science.

Security Science Research is the work aimed at discovering new elements of Security Science and is not simply a synonym for Security Research. Security Science research may be experimental or theoretical in nature. The discovery process for Security Science may employ scientific methods, formal engineering tools and techniques, etc.; however, not all security researches that use such a process are necessarily Security Science.[26]

The scientific research in the field of security is not only useful, but necessary. Many security problems accompanying the society since its inception continue to exist unabated, and as a result of social, scientific and technological change a new and threatening phenomenon has emerged. Threats to human security are constant, but it is possible to monitor and control the appearance of security threats. One of the conditions for that are their overall knowledge, as well as identification of mechanisms by which they can be controlled, which is one of the purposes of this scientific research. Effective models of resolving various security issues require a constant scientific research that follows the dynamics of social phenomena. On the basis of the findings about a renewed se-

22 For example, the safety, the security, the security organization, functions of security, security system, security agents, security forces, security services, security objectives, security measures, security activities, security threats, sources of threats to security holders of security threats, endangering the vision and form of security, object of security threats, consequences of security threats, the reference values, reference interests, the challenge of security, security risk, security threat, the concepts of security, individual security, human security, societal security, national security, international security, regional security, global security, etc..

23 Smith, C.; Brooks, D.: *Security Science – The Theory and Practice of Security*, Elsevier, Oxford, 2013, pg. 2-3.

24 Mijalković, S.: A research methodology in the field of security studies, Security - Police - Citizens, no. 3-4/2010, Ministry of Internal Affairs of the Republic of Serbian, Banja Luka, 2010, p. 361-371.

25 Milosavljevic, S.; Radosavljevic, I.: *Fundamentals of Political Science Methodology*, Official Gazette, Belgrade, 2003, pg. 53.

26 Meushaw, R.: *What is Security Science?,* text available on the 27th of december 2012th at http://cps-vo.org/node/6041

curity needs science offers high-quality applicable and practical solutions that are hardly possible without the process of scientific research.

The development of security sciences is necessary. The contribution of science in solving security problems has become evident in a number of master's theses, doctoral dissertations, monographs, studies, conference proceedings, scientific and professional journals, documentary films, lectures, seminars, scientific conferences and similar scientific and educational activities that are solely dedicated to the security. Of particular importance are the research projects that are conducted within the individual institutes, academic institutions, governmental and non-governmental organizations. Many of these projects are often financed by the ministry responsible for science, the public security sector, international organizations. The holders of the highest scientific degrees and titles who give special legitimacy to the results of the research[27] often participate in their implementation and reviewing.

Besides the obvious theoretical contribution, the scientific research in the field of security has reasonably great social significance. The research in the field of security involves interpreting the past, understanding the present, and trying to influence the security practice in the future.[28] Increasingly, the results of the scientific research in the field of security are used in practice, which is the best example of how its realization is justified. This way, the necessity of existing security as an empirical science is officially recognized while its existence provides an outstanding contribution to the security sector.

CONCLUSION

It is undisputed that security science includes autonomous and integrated corpus of several types and groups of scientific disciplines, which are characterized by an independent system of scientific knowledge. Mentioned disciplines are independent, unified and synthetic theoretical and empirical educational and scientific disciplines, within which the regularities in the security of society, government, international community and humanity are studied, but also the implementation, maintenance, enhancement and protection of their vital interests and values from a variety of threats coming from outside or within them.

As we have already mentioned, the evidence of scientific value for security sciences is that each of them has a unique and differentiated research subject, as well as inherent methodology, language and theory. Supports to this claim are numerous higher education institutions within which educational programs they found its place. In addition, it is a highly developed field of scientific research, as evidenced by numerous research institutes and numerous research projects in the country and across the globe.

In this regard, it is necessary that the academic community perceives the significance of a legal declaration of security as a scientific field, and to do it immediately. In this way it could be defined who can conduct security studies, which references the teachers must possess and what professional titles graduates will acquire. This would somewhat limit the unprofessionalism of newly established higher education institutions to hyper-product insufficiently qualified staff for the security sector.

In addition to contributing the richness of scientific pluralism, this would be a formal and legal recognition of "scientific matrix" of a number of institutions for higher education, which are currently accredited as a higher education institution for the management of security and defense, law, political science, criminalistic and other sciences.

Next, conditions will be made for the higher education profile acquired on security studies to be included in national nomenclature of professions. This will also formally strengthen the identity of many professions, which contributes to the strengthening of the integrity of certain number of professions.

In addition, the state and society will perceive scientific capacity of the education sector more realistic, which will cause them to be more reliant on them in performing their own operations.

It will also encourage the development of the research in the field of security, which will facilitate access to funding domestic researchers by international organizations that are earmarked to finance researches.

Finally, the academic community must develop awareness that the declaration of security as a scientific field could not cause any harm to anyone, but that the whole society will benefit from it.

27 Mijalković, S.: National Security, op.cit. pg. 20.
28 Williams, D.P. (ed.): Security Studies: An Introduction, Routledge, New York and Wolverhampton, 2008, pp. 1.

LITERATURE

[1]. Burke, A.: Aporias of Security, *Alternatives: Global, Local, Political*, Vol. 27, No. 1, 2002, pp. 1–27.
[2]. Buzan, B., Hansen, L.: *The Evolution of International Security Studies*, Cambridge University Press, Cambridge, 2009.
[3]. Buzan, B.: *People, States & Fear – An Agenda for International Security Studies in the Post-Cold War Era*, Lynne Rienner Publishers, Boulder - Colorado, 1991.
[4]. Buzan, B; Hansen, L.: *The Evolution of International Security Studies*, Cambridge University Press, New York, 2009.
[5]. Constitution of Police-Security Science, available on December, 20th, 2012, at: https://www.ncjrs.gov/policing/con93.htm
[6]. Croft, S.: What Future for Security Studies?, *Security Studies – An Introduction* (ed. Williams, P.), Routledge, London–New York, 2008.
[7]. Dillon, M.: *Politics of Security – Towards a Political Philosophy of Continental Thought*, Routledge, London–New York, 1996.
[8]. http://cordis.europa.eu/servererror/403.html?IP=37.19.108.121, available on November 19th 2012.
[9]. http://ec.europa.eu/research/fp7/index_en.cfm, available on November 19th 2012.
[10]. http://www.eutrainingsite.com/fp7.php?id=1&sid=1#euf, available on November 19th 2012.
[11]. Hughes, W. C.; Meng, L. (eds.): *Security Studies - a reader*, Routledge, London and New York, 2011.
[12]. Kolodziej, E. A.: *Security and International Relations*, Cambridge University Press, Cambridge, 2005.
[13]. Kotovčevski, M.: National Security of the Republic of Macedonia (I, II and III), the Macedonian civilization, Skopje, 2000.
[14]. Meushaw, R.: What is Security Science?, text available on December 27th 2012. at http://cps-vo.org/node/6041
[15]. Mijalković, S.: A research methodology in the field of security studies, security - police - citizens, no. 3-4/2010, Ministry of Internal Affairs of the Republic of Serbian, Banja Luka, 2010, p. 361-371.
[16]. Mijalković, S.: National Security, Academy for Criminalistic and Police Studies, Belgrade, 2011.
[17]. Milosavljevic, S.; Radosavljevic, I.: *Fundamentals of Political Science Methodology*, Official Gazette, Belgrade, 2003.
[18]. Mojanoski, C. definition of dilemma in the methodology of asphaliology, safety, environmental and security challenges of the Republic of Macedonia, Department of Security, Skopje, 2010.
[19]. Møller, B.: National, societal and human security - General considerations depicting the Balkan case, the Human Security (ed. Dulic, D.), No. 1, Faculty of Civil Defense, Belgrade, 2003.
[20]. Security Studies – An Introduction (ed. Williams, P.), Routledge, London–New York, 2008.
[21]. Simic, D. R.: The science of security - a modern approach to security, the Official Gazette of the FRY and the Faculty of Political Sciences, Belgrade, 2002.
[22]. Smith, C.; Brooks, D.: *Security Science – The Theory and Practice of Security*, Elsevier, Oxford, 2013.
[23]. Spaseski, J., Aslimovski, P. Defendology - learning for the safety, protection, defense and peace, Faculty of Education, University "Ss. Kliment Ohridski "- Bitola, Bitola, 2002.
[24]. Stajić, Lj: Basic system security research with basic security phenomena, Faculty of Law in Novi Sad, Novi Sad, 2008.
[25]. Terriff, T., Croft, S., James, L., Morgan, P. M.: *Security Studies Today*, Polity Press, Cambridge, 2001.
[26]. The Academy for Criminalistic and Police Studies in Belgrade - 90 years of higher education in Serbia Police, Academy for Criminalistic and Police Studies, Belgrade, 2012.
[27]. Vejnović, D., Šikman, M.: Defendology - social security aspects of the modern state, College of Interior Affairs, Banja Luka, 2007.
[28]. Williams, D.P. (ed.): *Security Studies: An Introduction,* Routledge, New York and Wolverhampton, 2008.

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THE ROLE OF ARMY IN THE SECURITY OF THE ROMAN STATE

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Abstract: The Roman state evolved from the early Roman city-state (polis) in the Apennine Peninsula into the most powerful slaveholding empire. In its thirteen-century-long history, it conquered many nations who inhabited regions across three continents: Europe, Asia, and Africa. For the duration of the Roman Empire, the army was one of the most prominent factors of power in Rome, both in times of war and in peace. As Cicero wrote, "military success spread the glory of the Roman people and earned it eternal fame". There was a period in the development of the Roman state (the period of military anarchy) when the military commanders of the various parts of the Roman army appointed emperors.

The Romans initially had a civil approach to the army, i.e. it was an honour of every righteous Roman to serve in the army (as well as to pay taxes to their state). All capable, wealthy, male citizens of Rome served as soldiers whenever it was necessary and the division of the spoils was solely the concern of the more prosperous classes. In time, when the militia was replaced by professional army and poor people became professional soldiers, mercenaries, who often had nothing to lose, but could gain a lot from the spoils the leaders promised them. They also opted for military careers because they hoped for promotion in the army and for an opportunity to a lead *centuria* - a company consisting of a hundred men (*centurions*). But when the personal interest outweighed the public, i.e. the state ones, the army became a threat to security and stability of the Roman state. Emperor Augustus was the first to realize and take timely action. He was a ruler who had a powerful army, but he reorganized it so as to leave only a few military units (*cohorts*) in Rome, entrusting them with security of Rome, whereas the other units were deployed along the border of the Empire, in order to protect the cities and military camps against the barbarians who threatened to conquer them. One of the main reasons for the decline of the Roman Empire was the fact that the Romans "were lost in the sea of other nations in a vast expanse". This resulted in the weakening of fighting spirits of the Roman citizens who were no longer willing to sacrifice their lives for any of their military commanders and not even for their country.

Keywords: glory and power of the Roman state, military success, the militia, the army of mercenaries, security of the Roman state.

Even today, there seems to be no answer to the intriguing question of how a small nation 'on the seven hills' managed to create and maintain the state that spread from Great Britain to Persia and India, from the Black Sea to Spain and Portugal, from German forests to the upper course of the River Nile."[1] There is no doubt that the development and survival of the Roman state (from a polis to an empire) were directly related to military activities. The army was the mainstay of the state, the prime mover of technology, economy, civil engineering, as well as the main protector.[2] For a long time, the basic unit of the Roman army was a legion, which initially consisted exclusively of the Roman citizens, only to be later expanded by engaging the troops of allies and auxiliary troops which were created from among the local population of the conquered territories, and later even with Barbarians, whom the Romans also included in their ranks.[3] The process of provincialization and barbarisation of the military seriously brought into question the efficiency of the Roman army.

Since it is common to study the history of the Roman state by following the developments in four periods: the periods of kingdom, republic, principate, and dominate – the age-long role of the army in the security of the Roman state (in preserving the regime, defence of the state against the enemy, and, naturally, in conquering foreign territories) will also be studied across the mentioned periods.

1 O. Stanojević, *Rimsko pravo*, Beograd, 2007, p. 40.
2 D. Lopandić, *Purpur imperije*, Beograd, 2007, p. 51.
3 The military service lasted 25 to 30 years, and sometimes even up to 40 years. Common legionaries joined the army at the age between 17 and 20. The army consisted of the active troops (*iuniores*) aged 17-46, and reserve (*seniores*) aged 46 to 60.

PERIOD OF KINGDOM

The first stage of the development of the Roman society – the period of **kingdom** is called the period of military democracy, when the army played an important role, given the fact that "the war and organization for war became the regular functions of people's life."[4] The state was still brand new and its institutions of power at that time: the king, the senate, and the assembly (*curiae* would for a long time retain the characteristics of the tribal gentile institutions, where all the members were equal, and the king was "the first among the equals." Ever since the earliest days the basic unit of the Roman army was called a legion and in its earliest period it was commanded by the king. The legion consisted of patricians and their clients, who were descendents of three original clans: Titians, Lucers, and Ramnis. There was no permanent, professional army; the army was national and all capable Roman citizens of male sex from the mentioned social circles were soldiers when it was required. Until the end of 2nd century B.C. only the richest participated in the military campaigns and therefore they were the only ones who participated in sharing the spoils. The main function of the then Roman army was the defence of the city, and possible military campaigns started mostly in spring and ended in autumn. Following a military campaign, most soldiers strived to return home, take a break, and then revert to their daily activities. Following the winter, which the citizens used to spend at home, new mobilization was performed every year. At times when Rome did not have a permanent standing army, the citizens did not serve in the military continually; mobilization was performed only on occasions of specific wars and lasted for the duration of these conflicts.

In the earliest period, the Roman army was organized within the framework of the system of curies and did not include non-gentile population (plebeians). The *curia*, as one of the 30 units in which the population of Rome was divided, had a military significance; each gave 10 horsemen and 100 infantry soldiers. The initial Roman army (legion) consisted of three thousand-strong infantry, three hundred horsemen, and lightly armed soldiers.[5] When the number of non-gentile population (plebeians) increased in Rome, it became necessary to attract the members of this poor, but free population into the military ranks. This meant it was necessary to change the existing method of preparing for the war. Since it was the time when every soldier took care of his own weaponry, only prosperous citizens could afford to be properly and fully armed. Around 494 B.C. King Servius Tullius set about the reform of the Roman military system, which was reflected in the reorganization of the system of recruitment in the Roman army. The citizens were for the first time divided into classes according to their wealth, which gave a plutocratic character to his reform. The reform of Servius Tullius instituted the assemblies of centuries which were "an Etruscan model of the people organized for war, where the military and electoral unit within the assembly was a centuria."[6] The centuries, as the units of a hundred men were organized in such a way that the wealthiest citizens, who constituted the cavalry, gave 18 centuries, and all others, who formed the infantry, were classified according to their wealth into five classes: from the first class, which included free citizens who had financial means to afford the military equipment of the heavily armed infantry, to the fifth class, which included the least prosperous citizens, armed with slingshots and throwing stones. The division of the Roman population into centuries was not aimed only at recruitment and new organization of the Roman army, but also gave a possibility to the plebeians organized into centuries to be in the equal position - at least on principle - with the patricians of the same property status.

THE ROMAN REPUBLIC

Towards the end of the military democracy and the beginning of **the Roman Republic** (when the mentioned reform of Servius Tullius took place), the plebeians started their struggle to attain equal economic and political rights with the ones granted to the patricians, because the letter had prevailed in the centuriate commissions (assembly), the senate and magistracies. The plebeians became indebted with the patricians and, being unable to pay off their debts, became the victims of the patrician usurers who could expose the insolvent debtor to torture, murder him or sell him into slavery *trans Tiberium*. This was stopped only after serious rebellions on the part of plebeians, who managed to secure the passing of such laws as enabled them to participate in the distribution of the land (the sharing of *ager publicus* in the conquered territories), to make settlements in the newly-

4 Engels, *Poreklo porodice, privatne svojine i države,* Zagreb, 1973, p. 150.
5 M. Mirković, *Rimska država pod kraljevima i u doba republike*, Beograd, 2002, p. 113.
6 A. Malenica, *Rimsko pravo*, N. Sad, 2008, p. 41.

established colonies of the Roman citizens, as well as to be granted the rights to redeem themselves from the debt bondage by joining the Roman legions and take part in the Roman conquests. [7] Having obtained the right to serve in the army, the plebeians, as soldiers, could take part in the centuiate and tribute commissions (assemblies).

In the times of the Republic, two young magisters (consuls), who changed every year, just like the other magistracies, took over the power and governed the country. Political and military functions of the king were transferred to the consuls. The authority of the magistrates comprised two groups of powers: *imperium* and *potestas*; the first mainly belonged to the senior magistrates (consuls, praetors, censors, dictator), and the other to the lower-ranking magistrates (quaestors, aediles, plebeian tribunes). The supreme power (*imperium*) granted to the senior magistrates (consuls, praetors, etc.) among other things, included the right to recruit army and the right to the supreme command of the army; the right to appoint higher-ranking officers, pass disciplinary measures, and dispose of the wartime spoils. Their decisions were implemented by *lictors* who accompanied them while on duty.[8] Certain duties in the military were also reserved for some of the *quaestors* who accompanied the army and collected the spoils, including prisoners.

Public mobilization performed by the consuls on the basis of the sensors' registers, was performed on the Capitol, where all military conscripts gathered on the day of recruitment (*dilectus*). When the wars were waged in more distant destinations and when the wars were becoming more frequent and against more numerous enemy forces, military life became a common daily phenomenon, so that the soldiers never left the military service, but constantly practiced and acquired war experience. The Romans were forced to keep the standing army throughout the year. Even the recruitment procedure was changed in time. The recruitment was no longer organized by the consuls, based on the censors' lists, but rather by specialized officials (*conquisitores*) who still made use of the censors' lists, but in time turned into a recruitment commission, which independently assessed whether a person was capable of serving in the army or not, and not only in Rome, but in the whole of Italy. Therefore they were often inclined to allow some individuals to be released from the military duty in exchange for money or some other favour.[9] Legions still constituted the basis of the Roman army and they became the bearers of the Romanization of new provinces founded by the Romans.

The ensuing centuries were marked by a reform of the military conducted first by the Gracchus brothers (133 B. C.) and then Consul Gaius Marius. The first reform ensured that no person younger than 17 must be recruited and that a soldier should be equipped at the expense of the state treasury. Gaius Marius (107 B.C.) made the army professional by allowing a soldier aged 16 to agree to serve for a period of 25 years, and in return the state provided him with equipment, weapons, regular salary in money, and a share in spoils. His reform allowed for the recruitment of the poorest Roman citizens who were given a plot of land in Italy upon completing their twenty-five years of military service. It was not hard to find people willing to join the army in Rome, where a lot of people were poor. However, this changed the principle of filling the army. It was the beginning of replacing the civilians' joining the army by enlisting volunteers for the army of mercenaries. Gradual departure from the historic scene of the old republican army, which was superseded by the army of mercenaries/paid soldiers, allowed that even 'proletarians' (poor citizens) start making up the majority of the Roman legions. It was a direct consequence of the practice of well-off citizens unwillingly going to wage war in the ever more distant and ever increasing longer-lasting wars, which was taken advantage of by the poor citizens, materially impoverished and expelled from the villages.[10]

7 T. Livije, *Ab urbe condita*, 2, 24.

8 *Lictors* had existed from the earliest days of the Roman Empire; they were a sort of bodyguard, first guarding the kings, and then in the period of the republic, the magistrates, protecting them during their public appearances. The dictator was in his company of 24 lictors, while the consul was guarded by 12, and praetor by 6 lictors. Lictors went ahead of the magistrate with bundles of twigs (*fasces*), from which protruded the ax, which symbolized their power. Lictors carried the twigs on the left shoulder, and a leader held a rod in his right hand, using it to remove from their path anyone who failed to move immediately. The bundles of twigs were carried in the city, whereas out of town they carried an ax, which shows that the lictor could execute the capital punishment on the spot. When the time showed that the guard of 12 people was not enough, the job of bodyguards was entrusted to selected soldiers (*extraordinarii*), and a special guard was composed of 500 men who were called the Praetorian Guard because they stayed in the camp, next to the commander's tent (*praetorium*). At the end of the republic, all the commanders that were to participate in the war operations had special guards - *cohorts praetoria*.

9 For more detailed information, see: Ž. Bujuklić, *Forum romanum*, Beograd, 2006, p. 239.

10 Ž. N. Rober, *Stari Rim*, Beograd, 2009, p. 114.

From the beginning of the War of the Allies (90-89 B.C.) which the Romans led against the Italics, Latins were granted the citizenship of Rome and the right to join the army. Thus the Roman legions were accompanied by auxiliary units (*auxiliae*) whose soldiers were recruited among local population. Thereby the practice came into life dating as far back as the end of the 5th century B. C. When the organization of the army changed so as to expand the roman legion by including the troops of the allies and auxiliary troops that were created from among the nationalities they belonged; they were commanded by the "allied prefect" and it was a Roman citizen appointed by the consul.[11] The auxiliary units consisted of foreign mercenaries who were mostly specialized, like the archers of Crete, or the ones who were skilful with slingshots; the auxiliary units also included new services, such as supply service, sanitary, engineering, etc.; all of this points out to the fact that the soldiers were no longer divided according to their wealth, but rather according to their abilities.[12] People coming from the provinces after 25 years of military service officially became the citizens of Rome, which entailed a range of rights and privileges.

The result of Marius' professionalization of the army was the political role of the army, which often installed or deposed the rulers, especially in the times of crises. There were situations in which the army produced successful commanders, who could secure as much of spoils and land for settling of their soldiers. The Romans "have no military genius of the Alexander the Great or Hannibal type since the commanders of the period of the republic are citizens-politicians, who had to engage in military arts/activities as amateurs; they were not especially educated in the arts of strategy and tactics, but achieved their goals by diplomatic means: to divide and rule (*divide et impera*), just like most of other conquerors in history.[13] The contribution of commanders - politicians to the major Roman conquests was obvious in the cases of the ambitious commanders such as Mario, Sulla, Pompeus, and Caesar, who started using the army in their political struggle so as to seize power. In the long run, this would aggravate the crisis of the Roman Republic and bring about its demise in 27 B. C., when Augustus came to power and established the Principate.

PRINCIPATE

Augustus' coming to power was aided by a special social stratum of people – equesters (*ordo equester*) who were very powerful and had great political influence. They originated from the cavalry, knights (*equites*) who appeared it the period of the Republic. They were the so-called 'businessmen' who were recruited from among the ranks of capable and apt plebeians who managed in a few generations to become rich by various financial transactions and banking speculations. Octavian August (27-14 B.C.) with whom the period of Principate began, understood the gravity of the threat to the security and stability of the roman state from the mercenaries, who often had nothing to lose, and could gain a lot from the spoils promised to them by their military commanders.

During his rule the transition to the standing paid army was completed. It was performed by making the praetorians - formerly member of the bodyguards of the Roman commanders – into a regular and paid army, which was "a tool, loyal to the emperor, body and soul". His own paid army – the praetorian guards, as the army of the city that August had for himself, made it easier for him to exercise his rule; as it became more numerous, it gradually took over the tasks of the army, which was managed by the Senate. Even later, when the assembly and the Senate lose their previous influence, the army will remain the only evidence of unity and power. The prefect of the Praetorian Guard (*praefectus praetorio*) was the commander of a military unit deployed immediately in the vicinity of the emperor and served as his body guards. The praetorians, as persons of the emperor's special confidence, had a substantial political influence, and their military authority spread across the territory of the entire Italy. They became the highest-ranking imperial officials and the main adviser of the emperor in the military questions, as well as administrative and judicial ones. It is known that a number of the most renowned Roman lawyers (Papinian, Paulus, Ulpian) performed this duty.

11 P. Grimal, *Rimska civilizacija*, Beograd, 1968, p. 163
12 For more detailed information, see: Ž. N. Rober, ibid. p.114.
13 O. Stanojević, ibid. p. 41.

Augustus left only a number of military units (*cohorts*) in Rome, which – as the army of the city – were in charge of the security of Rome, whereas the other legions were deployed along the borders of the Empire to protect it against the barbarians. The regular army that was deployed in the borderline provinces tended to gradually remain there; having received the compensation for their service in land and money, veterans usually settled with their families in the countries in which they had honourably spent their younger age. [14] Augustus also exacted a correction of the authorities in the provinces by ordering that the provinces were to be governed by the senators – governors, who received the title of proconsuls and propraetors. They had the highest power (*imperium*) which included civilian and criminal jurisdiction, public administration and the power of military command in the territory of the given province. In his capacity as the commander-in-chief, August reorganized the army from within/on the inside so that commanding officers were subordinated to him so as he could rule the Empire. The entire army had to be aware that August himself commanded them and that the career of every individual soldier depended solely on him. Anyone joining the army was bound by an oath to be loyal to August. The disciplined and reorganized army was a material mainstay of Augustus' rule. Discipline in the army was maintained by strict measures: corporal punishment, hard forced labour, redeploying entire units to other provinces (because of mutinies and unrests, especially in times of civil wars). The soldiers were engaged in public works, they supervised agriculture, stepped in to fill the vacancies in the customs services in the provinces, collected taxes, took part in the transport of crops, worked in mines, managed prisons, cleaned harbours of mud, worked in the money factory, in the factory of papyrus, kept guard on the rivers, etc. Every measure was taken to ensure regular payment of salaries to soldiers; a special treasury was established for the veterans and their (*aerarum militare*) was paid form this treasury. A significant number of troops were released: a lot of soldiers were given land in the newly-conquered colonies; others received substantial compensation in money and returned to their original municipias. The position of the praetorians remained exceptionally good even later, after August; they are thus known to have received the salary that was as much as three and a half times higher than the salary of the legionaries in the time of Nero (54-68 B.C.). They also received large rewards, often amounting to a five years' salary (*donavitum*) so that in time these well-chosen and disciplined soldiers would become a threat to any ruler.[15]

DOMINATE

In the period of **Dominate** (the fourth period in the development of the Roman state); the army became a threat even for the rules who relied on it because it played a role in the enthronement and deposition of the emperors. Its centuries-long role in maintaining the regimes and the defence of the state against the enemy was seriously brought into question following the reform of Septimus Severus, when the process of provincialization and barbarization of the army was initiated.[16] Military discipline was low; the legions often denied obedience to the ruling emperor and proclaimed the commander who promised them more privileges (and more money) the new emperors. The soldiers increasingly became a new class and unlawful conduct was no longer strange to them (rob-

14 E. Gibon, *Opadanje i propast rimskog carstva*, Beograd, 2007, p. 17.

15 Towards the end of the reign of Augustus, the army consisted of 25 legions, with the total number of 150,000 people. The legions were initially filled by Roman citizens, especially the residents of Italy. Since with the passage of time there were fewer and fewer volunteers, the authorities resorted to forced recruitment and even the legions began to fill their ranks with slaves who had previously been freed and given the rights of citizenship. In addition to the main units, there were some auxiliary troops with some of the legions that were filled by people from the provinces. The peregrine soldiers who served in the auxiliary troops (*auxilia*) acquired the Roman citizenship at the end of their service, and all honorably retired soldiers received the title of *veteres* and received some privileges (*diploma militare*). Support troops were under the command of the Roman citizens from the ranks of knights, usually members of the elite circles from Italy or from the provinces, to whom such service enabled promotion in the military.

16 Among many rulers who came to power thanks to the army, and who carried out a series of reforms in the army, Septimius Severus (193-211 AD) should be mentioned, as well as Diocletian (284-305) and Constantine (306-337). The words of Septimius Severus, addressing his sons before his death, have been reported to illustrate the importance of the army: "Get along well with each other, pay the soldiers generously, and the rest should not worry you". In his life, Septimius Severus reorganized the governing of the state on a military principle, and key positions in the government were taken by centurions and officers. Instead of Italics and Romans, he favored the soldiers from the Danube regions, African and Syrian legions. Each soldier could be promoted during his service and become a centurion or even a knight.

bery and violence) in dealing with the local population; they became undisciplined and ruthless. Another circumstance was that the legionaries, increasingly recruited from the ranks of barbarians, had become an army mercenaries engaged by the Roman authorities. This happened because vast numbers of Romans had lost their willingness to fight, but also because their number was reduced as result of the plague, economic disarray, and starvation. The economic chaos produced clashes for power between the central state administrative organs and major landowners. The large landowners organized special units of soldiers, as a kind of private army; they used these units to protect their autonomous estates. On the other hand, the oppressed categories of impoverished citizens, craftsmen, colons, and slaves cooperated with the barbarians and participated in a large number of individual sabotages and more massive armed skirmishes, so as to liberate themselves from the large landowners, tax collectors, and the tyranny of the soldiers.

During the military anarchy, which lasted for fifty years (235-284) and exhausted the empire, the changes on the throne were frequent. The crisis was ended by Emperor Diocletian (285-305) by exacting a series of reforms. He had begun his career as an ordinary provincial soldier from Dalmatia, whose parents were slaves at the court of a Roman senator. He became the emperor based on the vote of the army after the death of the Emperor Numerian, whose praetorians he had commanded. He took a large number of measures in the Roman state in order to elevate the ruler to the level of divinity; he reformed the central government in order to enlarge the army. These measures meant the final break-up with the Principate as an undercover monarchy and the final transition to Dominate (outright monarchy) where the ruler was "a god and a lord" (*dominus et deus*). Diocletian ruled for twenty-one years and was, like no other ruled before him, aware of the immense responsibility and danger arising from the rule of a single man. Therefore, he divided his duties and risk by separating the eastern part of the empire from the western part. Initially, he ruled the Eastern part himself, and entrusted the rule of the Western part to his brother-in-arms – Maximian. Upon the introduction of the fourfold government (tetrarchy) these two emperors (bearing the title of Augustus) had the supreme power. In 293 both of them engaged assistants with the titles of Caesars to rule better: Diocletian chose Galerius, and Maximian chose Constantius Chlorus. The mentioned assistants with the caesarean titles were chose form among the most capable officers who had already proved their military and other qualities.

Diocletian's decision to separate the military from the civil administration in the provinces proved to be very significant. "Military powers were assigned to the dukes (dux) who were elected among high-ranking officers; their scope of activities concerned the military, whereas the civil administrator (rector) managed finances; this reduced the possibility of conspiracy or revolting against the supreme authorities since there were at least two high-ranking officials in every district who were responsible directly to the emperor. At the court, units for the protection of the emperor were created (*palatine, scholae,* and *candidati*) dressed in magnificent uniforms, and thirty chamberlains or secret counsellors always stood in front of the imperial chambers." [17]

When Constantius Chlorus, one of the representatives of the "four-fold government"(tetrarchy) in times of Diocleatian, the British legionaries of Eduracum (today Edinburgh) elected his son Constantine (born around 280 in the then city of Nais, nowadays Nis). Having come to power, the Emperor Constantine (306-337) introduced a number of reforms in order to increase the significance and number of his military troops. Initially he adopted Diocletian's division between the military and civil authorities (which was introduced to limit the possibilities of the provincial governors to organize rebellions). Instead of the Praetorian Guard, whose number was reduced under the rule of Diocletian, Constantine abolished it in 312 and instituted special court units – *domestici, protectores* - as some kind of domestic guards. He managed an increasingly sophisticated network of special imperial subjects and informers who had the role of the secret police and were in charge of monitoring the state in the entire Empire and informing the emperor about everything as his "eyes and ears". [18] In the period of the empire, easily also acted as city police and became a regular army, which

17 For more detailed information, see: D. Lopandić, *Purpur imperije*, Beograd, 2007, p. 49

18 In the late Roman Empire (from the fourth century AD) the notorious secret police (*agentes in rebus*), which originated from the secret service of spies (the so-called cereal militia - *frumentarii*) from the second century BC. Initially, it was an organized group of imperial military officers who carried letters and other imperial documents into the provinces. Over time, they became supervisors of the post, so they travelled around the empire and gathered information, especially about the abuses of provincial officials, but also about other people and phenomena, and so they became the secret police, which had a very strong influence at the court and enjoyed great privileges (they could even reach the positions of senators). A. Romac, *Rečnik rimskog prava*, Zagreb, 1975, p. 48.

was to became a separate institution and its commanders had an increasingly important role in the government; this process led to the militarization of the state in the 3rd century.

Having consolidated his power, Constantine was convinced that he was the God's envoy and that all the others had to obey him. Keeping Diocletian's administrative division of the Empire (into dioceses and provinces), Constantine divided the Empire into four prefectures: East, Illyria, Italy, and Gaul. Prefects of the preatorias were appointed heads of the prefectures. Under them were the vicars of the dioceses, and below them were the *praesides* of the provinces.

That the time of Constantine was the when finally the civilian power was separated from the military power was proved by the fact that the prefects of pretorias were responsible for the civil authorities, whereas the army was commanded by special magistrates (*militum*). Under his rule the reform of the military was completed: the army was divided into border units (*limitanei*), into which legions and auxiliary troops were transformed, and the mobile army, which consisted of the mobile units in the heartland of the Empire (*comitatetenses*). These mobile units were to intervene where some grave danger threatened, whereas the border units were to constantly monitor the neighbouring barbarians.

The division of the Roman Empire in Western and Eastern part in 395 announced the end of the Roman Empire. In order to motivate the citizens of those times to go to war, because they found the military service increasingly less attractive (there were cases of young men who severed the fingers off their right hands in order to avoid recruitment), the state introduced the rule that a veteran could keep the estate he was given on condition that his son continues military service. [19] The reasons for the decline of power and the final end of the Roman Empire were manifold. Among other things, barbarians contributed to it by invading the Western part of the empire at the time of the rule of Valentian I and Valens (364-375); then the Visigoths moved in. Due to mistakes of the roman administration and the greed of the ruling class, which turned the Visigoths into slaves, a rebellion burst out and later, in 378, a great battle ensued near Adrianople, which the Romans lost. The Roman Empire never recovered from this defeat. The barbarian tribes, aided by the local Roman population (especially the Roman paupers, who, for instance, had opened the gates of Rome for the king of Visigoths, Alaric, who plundered Rome in 410), easily defeated Roman army and tore portions of the Roman Empire away. The battles against barbarians led to a military exhaustion of the empire and the plunderers' exploits destroyed the western economy. Previously enormous territory under the rule of the western emperor was reduced only to Italy, which was not immune to the struggle between the barbarian military commanders and weak emperors. This state was ended by Odokar, the German leader, in 476, when he deposited the last emperor of the Western Empire Romulus Augustulus. Small Barbarian states were created in the territory of the Western Roman Empire; their king granted plots of land (*beneficium*) to individuals on condition that they would go to war for him.

The Eastern part of the Roman Empire, future Byzantium, managed for some time to overcome troubles and recover and even to temporarily oust the Barbarians from the territories that once belonged to Italy. In the first centuries of Byzantium, the state, i.e. the emperor did not make it his practice to grant plots of land to the individuals who wanted to become soldiers. This was to occur later, starting from the 12th century, when the institution of pronia becomes instituted. The proniars were the individuals to whom the emperor, due to their deserts, granted plots of land (together with paricima) or another source of income (pronia), whereas the proniars in exchange were obliged to serve in the army for the ruler. [20]

Attempts to restore the Roman Empire that the Byzantine emperors after Justinian made remained futile. Byzantium disappeared from the historic stage after its thousand-year-long existence in 1453 when its territory was conquered by the Ottoman Empire. One of the reasons for the demise of the Eastern Roman empire was certainly the fact that the wars of conquest had grave consequences in more than one way; picturesquely said "the Romans became lost in the sea of other nations and in the vast expanses".[21] The belligerence of the Roman citizens decreased and they were no longer willing to sacrifice their lives for any state. The mobilization of new armed forces was not possible since all resources for recruitment had been exhausted, including the hiring of semi-private armies and foreign mercenaries. Financial expenses were devastating due to expensive military campaigns organized by the Byzantine emperors (Justinian and the others).

19 O. Stanojević, ibid. p. 94.
20 S. Avramović- V. Stanimirović, *Uporedna pravna tradicija*, Beograd, 2007, p. 165.
21 O. Stanojević, ibid., p.104.

CONCLUSION

In the thirteen centuries of their existence, the Romans had developed mechanisms of power and legal order that resisted all challenges. Even today many nations could learn from the Romans how to conquer and keep the power despite numerous difficulties. The Romans often resorted to the basic wise principle of politics – compromise (relenting). The power of the Romans in ruling the world reflected itself, among other things, in the stability and security of the Roman state (especially in the period of the Empire) which was ensured by including the most influential representatives of the conquered nations in the Roman system of government. This was enabled by the policy of giving the Roman citizenship to the soldiers who had completed their military service, as well as to the allies of Rome in foreign cities, establishing Roman cities in the provinces, and giving the privileges or rights of citizenship to communities outside Rome. Although some see this as "courting the provincial elite", it was well planned, confirming the qualifications of the Romans as wise, cunning, having a well-organized army, being connoisseurs of the psyche, and, above all, knew how to reward the most capable among them. In other words, they knew how to control envy, as one of the worst human characteristics.[22]

The true ideal of the statesmen of the old stamp reflected itself in serving in the military, which was the honour of every true citizen of Rome. When appetites for plundering and oppression of the neighbours appeared, and when greed for wealth prevailed, the division into the rich and the poor, all moral virtues of old Romans were forgotten. The civil concept of the army was to be replaced by the mercenary concept, which proved fatal for the Roman army, and thereby for the security of the Roman state itself. As long as there were spoils, there were wartime successes; as the loots dwindled, the appetites for waging wars and defending the Roman state decreased. There are several reasons that contributed to that the army became a threat to the stability of the Roman state over time/with the passage of time. Firstly, the mentality of the army changed, because the soldiers as the citizens-mercenaries increasingly focused on their personal interests and the interests of their commanders, neglecting the interests of the state.

The privileged status of the army became a threat to the very imperial power especially in the 3rd century A.D. when the embittered struggle for power was initiated between the senators and army commanders. When all of the senate emperors were assassinated (Guardian, Pupien, Balbin), the time of "thirty tyrants" began. It was the reign of terror of the emperors appointed by military commanders of the various parts of the roman army.[23] The soldiers, as a rule, chose the emperors among the candidates who promised the most generous gifts and maintained them in power as long as they fulfilled the obligations that had taken upon themselves.[24] As regards the changes on the throne by the army, it was sufficient for a commander to move his legions in order to seize the throne, and the combat for power would begin. At that, the least scrupulous commander had most possibilities. He would first settle his score with the ones who brought him to power. [25]

In the oldest time, to be a soldier did not mean to be privileged in relation to other citizens' this was to come later, following Marius's reforms in the 2nd century. In time, the army, accountable only to its own courts and itself, privileged and greedy, became a tyrant force that took all positions of power. The army enjoyed privileges which were reflected in the fact that the soldiers who committed offences in the military service were accountable to their superiors and towards the end of the post-classic period, and only the military court could try their cases; they enjoyed the imperial protection that was sufficient to justify even their crimes; they could make a testament with no formalities (*testamentum militare*), acquired special property (*peculium castrense*) which they could freely dispose of, and the legal misconception was recognized to them in concluding business/striking deals (*ignorantia iuris*). On the other hand, the importance given to the military service is obvi-

22 Unlike the Greeks, who practiced ostracism due to their envious disposition (which seems to be the Balkan syndrome). The measure was reflected in the fact that the one who stood out because of his qualities in a certain environment was expelled for a period of 10 years, on the pretext of the alleged concern for democracy. See more in: S. Avramović – V. Stanimirović, ibid., p.124

23 Maškin, *Istorija starog* Rima, Beograd, 1968, p. 529.

24 I. Puhan, *Rimsko pravo*, Beograd, 1977, p. 101.

25 This favored the thesis of Machiavelli that the ridiculous ruler is the worst solution, a frantic one - a moderately bad solution, and that the comparatively good solution was the unscrupulous ruler who will first settle his score with those who brought him to power. Taken from: O. Stanojević, ibid. p. 89.

ous from the classification of public offences. "The Roman state, unlike contemporary law, did not classify offences according to their common characteristics (such as offences against persons or against property) but classified them with respect to the fact as whether the public offence was committed by soldiers or other citizens. Thus the offences that could be perpetrated only by the soldiers included: treason (defection to the enemy and revealing a military secret), avoiding conscription, deserting the army, mutiny and failure to obey orders, insulting the commander, loss of weapons, attempted suicide, intentional self-injury; most of these offences were punishable by death penalty." [26]

REFERENCES

[1]. Avramović, S. - Stanimirović, V.- *Uporedna pravna tradicija*, Beograd, 2007.
[2]. Bujuklić, Ž.- *Forum romanum*, Beograd, 2006.
[3]. Engels, F.- *Poreklo porodice, privatne svojine i države,* Zagreb, 1973.
[4]. Gibon, E.- *Opadanje i propast rimskog carstva*, Beograd, 2007.
[5]. Grimal, P.- *Rimska civilizacija*, Beograd, 1968.
[6]. Lopandić, D.- *Purpur imperije*, Beograd, 2007.
[7]. Malenica, A.- *Rimsko pravo*, N. Sad, 2008.
[8]. Maškin, N. - *Istorija starog Rima*, Beograd, 1968.
[9]. Mirković, M.- *Rimska država pod kraljevima i u doba republike*, Beograd, 2002.
[10]. Puhan, I.- *Rimsko pravo*, Beograd, 1977.
[11]. Rober, Ž. N.- *Stari Rim*, Beograd, 2009.
[12]. Romac, A.- *Rečnik rimskog prava*, Zagreb, 1975.
[13]. Stanojević, O.- *Rimsko pravo*, Beograd, 2007.

26 For more detail see: A. Malenica, *Rimsko pravo*, ibid. p. 181.

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CLASSIFIED INFORMATION LAW OF THE REPUBLIC OF SERBIA

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Abstract: This work sets out to analyze the most important legal concepts of the Classified Information Law, noting that this field is yet to be regulated in detail by a subsequent set of by-laws to clarify a number of issues related to its practical implementation. Considering the applicable legal solutions envisaged so far by the Serbian legal system for the field of the classified information protection, we can conclude that numerous regulations in this area have not been brought in line with contemporary and generally accepted international standards and comparative legal experience, which has resulted in an inadequate protection of national classified information, as well as in impeded cooperation in the process of sharing classified information with other countries and international organizations. Democratization of societies, which concerns countries in transition in the present-day situation, has to be based on the principles of rule of law and welfare state, transparency and open society, which imply the reaffirmation of the public sphere. It should be noted that one of the objectives underlying the passage of this law was to enable transparency of work performed by all public authorities in various fields of their activities by considerably reducing the application of discretionary rights and arbitrariness when processing any kind of information.

INTRODUCTORY REMARKS

This work sets out to analyze the most important legal concepts introduced into the Serbian legal practice with the passage of the Law on Classified Information, while noting that this field is yet to be regulated in detail by a subsequent set of by-laws to clarify a number of issues related to its practical implementation. The first step on this path is to harmonize national regulations in the field of security with the EU and the Council of Europe standards relating to the protection of guaranteed human freedoms and rights and the achievement of both national and regional security interests. The second step would be to implement these legal solutions in the society and translate them into procedural and organizational practices of public authorities. The reform of the national system of classified information protection is one of the most important projects relating to the security system reform that Serbia has been facing in these processes. Considering the applicable legal solutions envisaged by the Serbian legal system for the field of the classified information protection so far, we can conclude that numerous regulations in this area were not in line with contemporary and generally accepted international standards and comparative legal experience which resulted in an inadequate protection of national classified information and impeded cooperation in the process of sharing classified information with other countries and international organizations.[1]

Some experts[2] in this field consider the security measures to be a set of activities, actions and procedures undertaken (independently or in cooperation with other persons) by the entities within the national security system in order to switch over from the state of the day-to-day organizational, personnel, financial, technical and functional capabilities to the state of hightened alert for carrying out security functions and assignments, whose complexity and gravity differ from every day activities - routine engagements. According to the method of organizing access to classified information, its processing was based on the departmental model, namely there was a number of rounded-off normative areas, in particular within the following systems: defense, foreign affairs, internal affairs and the Security Information Agency (after separating the state security department from the internal affairs system), the Justice Ministry (enforcement of prison sanctions and judicial authorities), the National Bank of Serbia, as well as other public administration bodies. The reform of the classified information protection essentially implies the following: 1) the national security system

1 – For further information on bilateral cooperation in this field, see the following: A group of authors, *The System of the Protection of Classified Information*; Belgrade 2012;
2 – Saša Mijalković, *The National Security* - 2nd edition, revised and supplemented, p. 359, published by the Academy of Criminalistic and Police Studies, Belgrade, 2011;

reform; 2) the constitutional and legal amendments through the harmonization with the EU regulations and standards in this area; 3) the education and trainings of the personnel directly involved in generation and protection of classified information; 4) the evaluation on the part of international institutions by establishing the process of bilateral cooperation and working together with the EU and NATO; 5) translating positive and negative practical experiences into adequate by-laws.

In the light of the above, it can be concluded that the regulation of the classified information protection system is an on-going process and the comparative experiences of the countries that have already gone through the same process indicate that it took them 10 years on average to fully transform their respective systems. After the dissolution of the Warsaw pact, the organization of the national security bodies for the classified information protection in the Eastern European countries (transition societies) were based on two characteristic models: *1) centralized model* (the Czech Republic, Slovakia, Bulgaria, Macedonia, Croatia, etc.) - characterized by setting up new security services (with general security or security competences) representing the central executive authority in the field of classified information protection and having a large number of employees and various competences ranging from the control of activities performed by the civilian and military security services to operations with classified signatures and provision of digital signatures, and *2) decentralized model (*Bosnia and Herzegovina, Montenegro, etc.) - constituting only one of the implementing authority for the classified information protection at the national level with the divided remit with other departmental ministries and agencies and functioning as a small sized professional agency dealing with the coordination of all competent state authorities engaged in activities on the classified information protection.

The Law on Classified Information was adopted in 2009 (*Official Gazette of the Republic of Serbia,* No. 104/2009) in order to introduce and institutionalize a uniform system for identifying and protecting classified information of interest to the country's national security, public security, defence, internal and foreign affairs, foreign classified information protection, access to classified information and termination of its classification, remits of the relevant authorities and supervision of its implementation, as well as the responsibility for non-compliance with the obligations stemming from this law and other issues of relevance for the classified information protection. This law is structured around the following sections: General provisions; Determination of classified information; Measures for the protection of classified information; Access to classified information; Procedure for issuing security clearances or security permits; Control and supervision; Penal provisions, and Transitional and final provisions. Since its promulgation in December 2009, a number of related by-laws have been adopted by virtue of this law.

The work on classified information is regulated by a number of systemic regulations, the most important among them being the following: the Law on the free access to information of public importance, the Law on the protection of personal data and the Law on Classified Information. The processing of classified information is also governed by the regulations enacted in the area of defence, internal affairs, health, security services, etc. Information in most general terms can be divided into several categories: public information available to the general public and disseminated by various communications media due to which it is called "open information" in professional circles. Then, there is information with restricted access for various legal reasons, namely: 1) **Information of interest to the Republic of Serbia**, comprising any information or document possessed by the public authority within the meaning of the Law on classified information relating to the territorial integrity, protection of constitutional order, human and minority rights and fundamental freedoms, national and public security, defence, internal and foreign affairs of the country. Therefore, in the formal sense of the word, such information is declared classified by virtue of the relevant law, other regulation or a decision of the competent authority and identified and marked adequately with one of the following classification levels: RESTRICTED, CONFIDENTIAL, SECRET and TOP SECRET; 2) **Personal data imply any information relating to an individual, i.e. a natural person, regardless of the form in which it is recorded and its storage medium,** (paper, tape, film, electronic medium and the like), and irrespective of the circumstances under which such information is stored, the method of obtainment (by listening or watching, through access to a document, etc.) and other properties of that information. Therefore, personal data are any information relating to a natural person if he/she is identified or identifiable; 3) **Trade secrets** are regulated by separate provisions governing the medical, psychiatric or psychological practice, lawyer or clerical vocation and are not included in the area of the classified information protection; 4) **Professional secrets** belong to an area which is not as yet adequately addressed under the existing regulations and are reduced to the legal ground only in the

form of an article in the Law on Companies which leaves the issues of processing and criteria to companies for further regulation. The requirements relating to professional secrets should be determined similarly to the criteria envisaged by the Law on Classified Information, which means according to the form and extent of the damage caused to companies as a result of an authorized disclosure.

PROCESSING WHEN THE PUBLIC HAS A JUSTIFIED INTEREST IN KNOWING THE INFORMATION[3]

The provisions of the Law on public information[4] regulate the right to public information as the right to freedom of expression and the rights and duties of participants in the process of disseminating public information. The right to public information implies the freedom of expression, gathering, investigating, releasing and disseminating ideas, information and opinions, as well as of printing and distribution of newspapers and the press, the freedom of production and broadcasting radio and TV programs. The said right also includes the freedom to receive ideas, information and views, and to establish other legal persons dealing with public information. The press is free to publish ideas, information and opinions on various phenomena, events and persons that the public has a justified interest to be informed about, except when it is otherwise provided by the law which is applied regardless of the manner in which information has been obtained. Government and political office holders have a limited right to privacy protection if the information related to them is of relevance to the public, given that their right to privacy is restricted in proportion to the public interest in knowing the information related to them. The provisions of the Law on the responsibility for human rights violation[5] (lustration) regulating or rather determining the following: - forms and aspects of human rights violation as a basis for investigating such responsibility; - individuals who undergo the procedure for investigating the responsibility for human rights violation; – principles and rules of the procedure for investigating the responsibility for human rights violation; - composition, competence and procedures applied by the relevant authorities; and – measures imposed on individuals who have been found responsible for violating human rights. It is interesting to note that the applicable procedure under this law that is carried out without consent of the individual concerned. The relationship between free access to information and accomplishment of tasks to protect classified information is one of the newly emerging issues in practice. According to the Law on free access to information[6], the public is to be provided access to classified information. However, the provisions of Article 9 stipulate certain exceptions relating to the following: 1) the national security; 2) the public security; 3) commercial and other public and private interests of economic nature; 4) the national economic, monetary and foreign currency policies; 5) prevention, investigation and prosecution of criminal offences; 6) privacy and other individual rights; 7) processing and enactment of official documents. Furthermore, the implementation of the Law on free access to information is made more difficult by the fact that it was adopted before the Law on Protection of Personal Data (2008) at the time when the Law on Classified Information was not in place, although it should have preceded the above two legal acts as an umbrella law to facilitate the implementation of the Law on Free Access to Information.

OBLIGATIONS STEMMING FROM THE LAW ON CLASSIFIED INFORMATION[7]

The Law on Classified Information has introduced a new systemic approach to the classified information protection in the Republic of Serbia which is based on the applicable EU and NATO security, legal and technical standards which are also implemented in the legal systems of the neigh-

3 – For further information, see the following collection of papers: *Access to Information of Public Importance and Classified Information Protection*; Belgrade 2012
4 – *Official Gazette of the Republic of Serbia,* No. 43/2003 and 61/2005
5 – *Official Gazette of the Republic of Serbia* , No. 58/2003 and 61/2003
6 – For further information, see the following publication: *Classified Information and Free Access to Information*; Belgrade 2010
7 – Note: these obligations apply to activities on foreign classified information only until the criteria for work on information classified as TOP SECRET, SECRET, CONFIDENTIAL and RESTRICTED are determined and regulated

bouring countries.[8] The law itself has imposed certain obligations on the public authorities which are as follows: 1) drafting of by-laws and determining criteria for the RESTRICTED and CONFIDENTIAL classification level; 2) drafting of by-laws relating to a number of special protection measures; 3) harmonizing the current regulations relating to work on classified information (office management, etc.) with the current Law on Classified Information; 4) amending international agreements involving the exchange of classified information and establishing separate registries for that purpose; 5) modifying the existing rule books on internal organization, job systematization or formation posts by introducing classification levels to which employees may have access to when carrying out their duties; 6) drafting of documents on transmission of classified information, application of general and special measures, etc; 7) designating a security officer in the public authority and establishing the registry system for work on the national classified information; 8) setting up a continuing education system in the area of classified information protection; 9) keeping official records in line with the Law on classified information 10) establishing direct cooperation and communication with the Office of the National Security Council and Classified Information Protection; and 11) developing internal regulations on INFOSEC, i.e., Information Assurance.

FINAL REMARKS

"A journey of a thousand miles begins with a first step". The Republic of Serbia has been making great efforts to regulate the issues of generating and processing classified information in the legislative area while implementing in-depth reforms in the security (and defence) sectors. The first step in that direction was made by putting the Law on Classified Information in place in 2009 and the next one will be the passage of an adequate law on Information Assurance to be followed by a set of pertinent by-laws to fully regulate this area. However, the legislative activities in that area are somewhat delayed due to the complexity of its scope which will require modifications of other legal acts in line with the present practice and international standards. The implementation of the Law on Classified Information itself will facilitate the establishment of cooperation at the highest level between the Republic of Serbia, NATO and EU defence systems, thus enabling members of the Serbian Defence Ministry and Armed Forces (including representatives of other state authorities and legal persons) to take part in various international activities that involve access to particular classified information.

Moreover, one of the purposes of this law is to facilitate the transparent functioning of all public authorities in their varied scope of activities by substantially limiting their discretionary rights and arbitrariness in the course of processing any kind of information. Finally, it should be mentioned that the issues relating to the archival materials kept by the public authorities and the question of opening so-called "classified files" are not the subject of this law whose purpose is to regulate only activities on classified information as and when it is generated.

REFERENCES

[1]. *Access to Information of Public Importance and Classified Information Protection,* collection of works; Belgrade 2012

[2]. *Classified Information and Free Access to Information;* Belgrade 2010

[3]. Group of authors, *Systems of the Protection of Classified Information*; Belgrade 2012;

[4]. Matić, G.; *Law on Classified Information* (*an analysis of some concepts); Novi glasnik*, No. 1-4/2011; pp.19-38

[5]. Mijalković, S. *The National Security,* 2nd edition revised and supplemented, Academy of Criminalistic and Police Studies; Belgrade 2011

[6]. Milošević, M. *State Security System*, Academy of Criminalistic and Police Studies; Belgrade 2001.

8 – Matić G.; *Law on Classified Information (an analysis of some concepts*); *Novi glasnik*, No.1-4/2011; pp. 19 - 38

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STRATEGIC THINKING AND PROTECTION OF NATIONAL INTEREST

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Abstract: The paper attempts to highlight the importance of strategic thinking and its continuity in the continuous process of searching for the most optimal conditions for the protection of national interests. It analyzes some of the main features of the modern world which make strategic reflection of reality the crucial point in the process of defining the position of a political entity in the environment created by global processes. In this context, this article aims to offer arguments that strategic thinking is primarily an intellectual activity that has a rational and methodological foundation, and the fact that the initial determinants of strategic thinking are under the strong influence of strategic culture. It also presents the views in favor of the request that the strategy of the state should be the highest level of national reflection of strategic reality.

Keywords: strategy, strategic thinking, strategic environment, strategic culture, state strategy.

INTRODUCTION

The eternal question is how to find the most suitable options for protecting national interests and values, and what strategic and conceptual preparation for the challenges and constraints imposed by the strategic reality basically involves. Volatility and unpredictability of the world puts a modern society with serious challenges. The increase in insecurity and uncertainty, as well as their projections for the future are challenge for strategists in ways not seen in the past.

Strategic thinking is primarily an intellectual activity, which should eliminate the elements of hazard and spontaneity in the existence of a nation or state. Today, more than ever, the survival of a society and its development depends on the mental thinking of the ways to ensure the protection of national interests. This means that strategic thinking is primarily focused to create mechanisms of defense against violent threats that have their source in the strategic reality.

The problem of strategic culture is an indispensable ideological milieu of strategic thinking. As such, it is a concept with enormous implications. In the end, people are creations of their culture. Everything that people think and do is based on the adopted forms of their cultural matrix. Constructivism confirms importance of culture and has generated new attention to ideational foundations of national security policy behavior.

Protecting national interests and objectives puts the state strategy at the highest level of national considerations of strategic reality of a political community. Full theoretical foundation of the state strategy, with its formulation implying the engagement of the leading intellectual and spiritual potential of an entity is the obligation of particular importance in defining the key prerequisites for the survival and development of the society and the nation.

MODERN WORLD AND STRATEGIC THINKING

Character and dynamics of relations in international politics, which is torn between the vision of a global society and political practice that has its continuity throughout the history of human civilization, clearly confirm the importance of strategic considerations of the position of political communities in such a profiled strategic reality. Today, it is evident that the processes of globalization, instead of harmonious world, create the world of risk and uncertainty[1]. The consequences of a high level of development of science and technology and their retroactive effect on the society have, on the one hand, the unexpected achievements in improving all aspects of individual and collective human existence, but, on the other hand, frightening expansion of asocial phenomena and occurrence of security breaches and proclaimed fundamental values of the international community. The

1 Stanislav Stojanovć, *Globalizacija i bezbednosne perspective sveta*,VIZ, Belgrade, 2009.

dominance of these phenomena generates the increased problems of national and international security that carry new energy and new content, and make the contemporary world the global risk society[2].

The biggest security challenges of the modern world are the problems of growing economic inequality, poverty and transnationalization of a wide range of socio-pathological phenomena, as well as the growing ecological disturbance and destruction of the natural environment and biodiversity on earth, which are in the conditions of global connectivity beyond time and space constraints, as well as divergent demographic trends and the limitation of energy and nonrenewable resources. Security of the modern world is particularly vulnerable to threats emanating from terrorism, ethnic and religious intolerance and extremism, proliferation of weapons of mass destruction and organized crime. Conflicts motivated by ethnic tensions, attempted secession and cultural and religious differences are becoming a huge potential to destabilize the wider areas and the escalation of conflicts in many parts of the developing world. Some internal conflicts, especially those involving ethnic violence, carry the risk of spreading and growing into a regional conflict. Of course, opposed geostrategic interests of the great powers is the reason for increased political tensions and the potential for confrontation at the global level.

All these challenges are real, and the "paradigm of a harmonious world" as it was announced at the beginning of the nineties of the last century, is too far from reality.[3] Despite optimistic claims that it is unlikely "the wars and revolutions that have reshaped the world in the twentieth century will be characteristics of the twenty-first century"[4], the warnings remain related to the possibility that security threats that marked the last decade of the last and beginning of this century, continue to create the character and dynamics of trends in the field of security in the future. The problems of economic inequality, resource deficit, demographic eruption, ethnic and other animosities, the marginalization of the international order and the instrumentalization of international relations will be the dominant characteristics of the state of global security. The dominant actors in international politics will continue to be only the major countries[5], which will build their foreign appearance guided by their geopolitical interests.

Fundamental features of the strategic environment demand that the challenges, which are realistic, are carefully, systematically and continuously discussed, to make strategic position less dramatic and the protection of national values and interests in the future more effective. Strategic thinking in this process is a crucial point, because, it is necessary to revitalize its position and create the conditions for strategic reflection of reality to be a framework for political and other actions. Strategic thinking must be based on the undisputed intellectual and methodological assumptions which will provide applicable response to the challenges of complexity of geopolitical environment.

The focus of strategic thinking should be on the state's ability to survive, where the strategy must consider international relations with equal attention, but also, as Lawrence Freedman properly concludes, the complexity of social relationships in a country[6]. Namely, the states with internal problems, the development of which is not based on the natural social cohesion, are much more exposed to external constraints and pressures. The same author rightly emphasizes the position of power in the positioning of a country in relation to its environment. Of course, he admits that power does not always bring the desired results, but it is certainly more efficient than any other means. Therefore, for Freedman, the central concept of strategy is power, because strategy is the art of creating power[7]. Of course, the best strategy, according to Clausewitz, is to be powerful, but the power is not available in sufficient quantity, primarily to small states. Therefore, the strategic approach must involve such tools that in the most optimal way may correspond to the conditions and restrictions imposed by the international system.

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2 Urlich Beck, *Risk Society,* Filip Višnjić, Belgrade, 2001.
3 Samuel Huntington, *The Clash of Civilizations,* CID, Podgorica, 2000, p. 33.
4 Michael Mandelbaum, *The Ideas that conquered The World,* "Filip Višnjić", Belgrade, 2004, p. 294.
5 Jozef Nye, *Understanding International Conflicts,* „Stubovi kulture", Belgrade, 2006, p. 25.
6 Lawrence Freedman, "Strategic studies and the problem of power", *Strategic studies A Reader*, edited by T. Mahneken, J. Maiolo, Routledge, New York, 2008, p. 31.
7 [6]Lawrence Freedman, ibid, p. 32.

There is no doubt that nervously event history[8] makes the modern world does not require less strategic thinking than it was in the past. On the contrary, the more complex strategic reality is, the more strategy is required and less arbitrariness, hazard and coincidence[9]. Hence, the complexity of the modern world and the numerous challenges it faces make the strategic thinking indispensable prerequisite in finding the most appropriate ways to protect and promote national interests, especially of small states. The ability to think strategically is the ability to face the problems posed by the future.

Of course, the importance of strategic thinking related to strategic reality of a political community has a long history. Since the days of the Chinese philosopher Sun Tzu, whose thinking even today, after more than twenty-three centuries, is still valid, the art of war, or strategy, "has been of vital importance to the state. It is a matter of life and death, the path to security or collapse"[10] That's why the strategy is the most important national job and its main goal is, as Tzu deemed, to show how the state should become invincible without a fight, but with the knowledge. His strategic thinking is based on the request to become invincible, as for him it is the ultimate goal of any strategy. Ever since, strategy has involved thinking effort to define the most appropriate ways to utilize the resources and tools that should provide secure protection and progress of a political community.

STRATEGIC THINKING – MENTAL REFLECTION

There is a belief that strategic thinking is primarily a mental activity which should eliminate the elements of spontaneity in the existence of a nation or state. Today, when the conditions of individual and social existence of people are determined by the achievements of information society and technological progress, more than ever, knowledge resources are a strong incentive for the reaffirmation of the strategic approach to reality. Even more so because the greatest benefit of a state is not what is given but what is set[11], meaning the need for putting significant effort into strategic thinking of the ways to preserve vital national values and interests.

For Colin Gray strategy is neither policy nor a battle, it is the bridge linking politics and battle[12]. Also, it can be said that the strategy is neither a skill nor science; it is in some way both of these. As a skill, it involves the ability to think strategically through experience, observation and learning. As a science, strategy implies thinking that requires pursuit of knowledge, which, among other things, involves identifying and defining strategic problems, gathering and analyzing information and the formulation and testing of possible solutions.[13] Hence, no matter there are some people who advocate the idea that strategists are born, modern strategists cannot be without adequate knowledge. This means that education is a key prerequisite in the process of building capacity for thinking strategically about security and finding the ways for the achievement and improvement of security. This fact is particularly prominent in the context of global processes and increasing insecurity of the world, affecting increasingly powerful process of redefining the role of modern armed forces and places new demands on the officer corps, and the civilian leadership, as well. The capability for strategic insight of the complex security environment and the increasing number of the factors of uncertainty and risk becomes a priority. The strategy, the thematic content of which today go far beyond the authentic scope of military activities, has a special place in the development of these capabilities of officers and civilian officials.

The area of strategy research concerns the strategic reality, which is in modern conditions subject to almost startling change by degree of civilization breakthrough of IT revolution, and these technological achievements are fully reflected in the military. Many aspects of techno-

8 Dragan Simić, *Nauka o bezbednosti*, „Službeni list SRJ", Belgrade, 2002, p.12.
9 Robert Kennedy, "The Elements of Strategic Thinking: A Practical Guide", *Teaching strategy: Challenge and Response*, U.S. Army College, Strategic Studies Institute, 2010, p. 10.
10 Sun Tzu, *The Art of War,* Mono i Manjana, Belgrade, 2009, p. 17.
11 Dušan Višnjić, *Strategija države kao sudbina nacije,* VIZ, Belgrade, 2006, p. 98.
12 Colin Gray, "Why strategy is difficult", *Strategic Studies A Reader*, edited by T. Mahneken, J. Maiolo, Routledge, New York, 2008, p. 394.
13 Robert Kennedy, ibid, p. 15.

logical development of the modern era contributed to the fact that the war as the most drastic form of social conflict becomes complex, pervading social phenomenon, which means the engagement of all available resources and a much broader context of actions and measures that the society should take to protect the fundamental values and interests. New contents of war as total conflict resulted in the fact that the subject of strategy research exceeded the content of warfare, including a number of non-military aspects of defense organization of the state, or activities that affect the function of defense of the state as a whole. This fact suggests the need for thorough theoretical overview of the current strategic reality and forecasting trends in the strategic environment that jeopardize the supreme good of a political community. It is meaning the need for permanent thinking effort in strategic thinking of the ways to preserve vital national values and interests and to defining an appropriate governance strategy.

For strategic thinking, which defines the basic discourse of a political community, it is important whether such thinking is achievable, and how successful it is. In this regard, strategy, as primary thinking of the position of a state in strategic reality, should be properly organized and should not contradict the idea of desirable[14], and as such, implying a certain mental image of the projected reality. As not contradicting the idea of desirable, strategy essentially includes the choice and selection of means for achieving the projected goals. Logically, the relation of means and goals, as Simić concludes, is a neuralgic core of feasibility of any strategic idea[15]. Just because of this strategic thinking should be rational choice in terms of means and goals, above all, taking into account the resources available.

Thinking about the war shows that it is a product of the human spirit, because fighting war involves specific mental forms and processes. Actions concerning war require special spiritual profile, a certain type of understanding of things and a certain type of mental skills and concepts. Thoroughly studying war, Clausewitz concluded that all war actions are imbued with the power of intelligence and its effects. Therefore, the question of how to think in order not to do anything and anyway is an essential requirement set before strategic thinking that should provide a more consistent relationship between action and thought. The transformation of modern warfare and the growing number of factors of uncertainty and risk that characterize contemporary reality, more than ever before require having a clear idea of what is intended to be done and the idea on how to achieve it. Randomness and spontaneity in the application of available resources, according to Kennedy, cannot be considered strategy. Old pursuit of strategy was and remains to reduce the disadvantages of randomness that characterizes every action.

The issue of the dilemma that accompanies a strategy remains unresolved until the end – whether it is the result of intuition or reason. Some authors advocate the idea that the strategic thinking is much more than rational action and that successful strategy comes not from rigorous analysis but from a special state of mind. "The mind of strategist, insight and consequent drive for achievement ...fuel thought process which is basically creative and intuitive rather than rational"[16] Of course, according to the same author, strategists do not reject the analysis and without it they find it hard to be strategically creative, but they use it only to stimulate their creativity, to test ideas that occur and to predict the strategic consequences of these ideas. Hence, for some people, these statements confirm the claim that the strategists were born, which means that they are not created. However, the same author believes that the mindset of a strategist may in some way be reproduced in people who have a lack of natural talent for strategy. For this, there are specific rational concepts and approaches that help develop the mindset that may have a predisposition to create superior strategic ideas.

However, no matter how correct the above positions are, the realm of uncertainty, what the modern environment really is, requires that strategy, as primarily a thinking activity, systematizes the research of conditions of rationality of action and rationality of instruments. Following the idea that rational thinking and the application of certain procedures may be the basis for stimulating the creative process in the strategic decision-making, Kennedy tries to define some universal elements of creating strategic thinking. He offers seven elements of

14 Dragan Simić, *Svetska politika, međudržavni i međunarodni poredak, svetska politika i globalni odnosi,* „Čigoja štampa", Belgrade, 2009, p. 182.
15 Dragan Simić, ibid, p. 182.
16 Robert Kennedy, ibid, p. 25.

strategic thinking, believing that these are assumptions without which rational thinking is not possible. Those elements are analysis of the environment; defining interests and goals; identifying the main opponents and competitors and other relevant actors; identification and analysis of possible options and the likelihood of their success; selection of options and analysis of alternatives in terms of potential friction; reoptimization in light of changed circumstances; evaluation of options and modification of options or replacement by other options.[17]

The proposed structure and content of the elements of strategic thinking is correct, because the strategic review of the position of a community primarily should define its interests and goals, assess what threatens those interests and goals and, finally, offer an instrument for their protection. Such methodological matrix should be the basis for strategic thinking to provide strategic preparedness of the state for the integrated application of available resources to achieve the desired national goals. It is undisputed that the absence of strategy increases the likelihood of failure.[18]

STRATEGIC CULTURE AND STRATEGIC THINKING

Strategic culture is an important aspect of strategic thinking and strategic behavior. Culture is the identity and loyalty of people to specific forms of behavior, that's what they think about themselves, society and the world in which they live, but that is also the way they define their relationship and behavior toward the values of their environment. Everything the people think and do has the context of culture and it is a strong driving force of thinking and behavior. Culture creates a matrix of friendship and enmity and relationship to others, as well as a matrix for the perception of the own being, manifesting a direct or indirect shaping effect on the decisions and behavior of individuals and social groups.

Theorists cannot agree on the concept of strategic culture. For Jack Snyder, strategic culture is "the sum of ideas, conditional emotional responses and patterns of habitual behavior shared by members of a national strategic community in relation to nuclear strategy"[19]. Colin Gray defines strategic culture as "the persistent (though not eternal) socially transmitted ideas, attitudes, tradition, habits, as well as preferred methods of action that are more or less specific to the security community, based on a specific geographic area, which necessarily had a unique historic experience".[20] For Ermarth, strategic culture is a mass of widespread, very influential and enduring attitudes, perceptions and preferences on national security, which shapes the behavior and policies of a state.[21] According to Smith, strategic culture is a derivative of political culture, but he makes a clear distinction between strategic and political culture. Political culture refers to the appropriate attitude of the community toward the models of governance and power, while strategic culture refers to the attitude of political community toward the national style of war[22].

Since the earliest time, the political practice has confirmed the fact that there are noticeable differences between countries in terms of the ways of thinking about security and the model for the use of force. In their works, both Sun Tzu Wu and Thucydides emphasized the importance of culture and its relationship with strategy. There were some strategists who recognized the differences in the approach to war and used such information as an asset in conflicts. Clausewitz thought that the subjective side of the war, that was constantly changing, was especially shaped by the strategic culture of the warring parties. He was convinced that the war was a conflict between two wills, and the will of militancy was the product of moral factors that could be seen as a culture.

17 Robert Kennedy, ibid.
18 Robert Kennedy, ibid, p. 16.
19 Jeffrey S.Lantis, "trategic culture: From Clausewitz to Constructivism", Defense Threat Reduction Agency, USA, SAIC, 2006, p. 6.
20 Colin, Gray, 1999. "Strategic Culture as Context: The First Generation of Theory Strikes Back". Review of International Studies 25: 49-69.
21 Ermarth, W. Fritz, (2006*) Russia's Strategic Culture: Past, Present, and… in transition? Defense Threat Reduction Agency Advanced Systems and Concepts Office,* Comparative Strategic Cultures Curriculum.
22 Stephen B. Smith, *The Geographic Origins of Strategic Culture*, Khazar Jurnal of Humanities and Social Sciences, Baku, p. 42.

Greek mythology is a strong source of different models of strategic culture within which different approaches to the security of political community are established. Even today there is a rally between two strategic traditions, one of which uses the model of warlike Achilles and the other which uses the model of Odysseus's reconciliation and restraint[23]. Strategic tradition the postulates of which are based on the myth of Achilles sees the world as an "anarchic arena" where the power and brutal force is the primary guarantor of security. On the other hand, strategic tradition the thinking of which is based on the myth of Odysseus, argues that peace and security can be achieved through pragmatic actions, including cooperation with other actors.

Serbian strategic culture, which is also essentially based on the myth of the Battle of Kosovo, is another example of a specific ideological milieu toward the most important values of an ethnic community. Kosovo testament and the myth of the heavenly people who is called to defend the universal basis of morality and justice is the axis of the spiritual identity of the Serbian people and the dominant tradition of its strategic culture. Ethical and axiological value of the Kosovo myth creates a certain perception of national security and exerts great influence on the defining relations of the Serbian people toward the challenges of strategic reality through most of its history.[24]

Colin Gray is one of those who first tried to show the importance of local context, national history, norms of values for the way of perception of security, and therefore advocated for greater inclusion of cultural explanations in security studies. Today there is a widespread attitude of theorists that each country has its own way to analyze, interpret and react to events in the environment that is more or less under the influence of the local culture. Such an attitude implies a belief that the interests of one state and ways to protect them are always defined by the actors that are necessarily influenced by the variety of content of strategic culture.

Theorists do not agree on the source of strategic culture. Basically, geography, history, sociology and anthropology are often cited as sources of strategic culture. Geography as a source of strategic culture is an idea that can be found in the oldest historical monuments, so as Smith argues, geography is the best starting point for examining the roots of different strategic cultures.[25] According to him, people in the whole of human history have developed different styles of their own organization in order to adapt the local environment to their own needs. Ethnic groups inhabit different areas with specific geographical features and build different ways of using the territory to ensure their own survival, which eventually become part of their cultural identity.

Hippocrates believed that differences in character between people may be explained by the climate and geography of the area in which they live, highlighting the geography and climate most directly create the character of individuals and the character and nature of the whole societies. Similar considerations are present in Herodotus, later in Montesquieu, Kant, and the representatives of geopolitical schools, and especially important idea from the standpoint of strategic culture is that geography exerts a powerful influence on the intensity of interactions of a nation with their neighbors. The societies that are surrounded by harsh geographical conditions, or isolated, tend towards autarchy and they are significantly reserved toward other ethnic and political communities. It is especially important to note that the geography is a cornerstone of specific styles of warfare and defensive orientations.[26] In addition to these considerations, Smith talks about dichotomy of continental and maritime forces, emphasizing clear contrast between the island and mainland states which reflects not only on the size and structure of the military force, but also on their strategic orientations and approaches to the war.

In Gray's opinion, history is the primary source of strategic culture, in other words, people are their history, or more precisely, the people are what they think should be their history.[27] Hence theorists who privilege the position of history in the formation of patterns of strategic culture believe that geography provides the basics, but history gives shape to culture. This means that geographical reality does not determine culture, but set the stage, allowing history to shape culture. It is certain that history and geography have a major impact on the profiling of

23 Zoran Krstić, Borislava Grozdić, „Kosovski zavet i srpska strateška kultura", *Зенит*, број 12/ 2012, p. 147.
24 Zoran Krstić, Borislav, Grozdić, ibid, p. 145.
25 Stephen B.Smith, ibid, p. 45.
26 Stephen Smith, ibid, p. 47.
27 Stephen Smith ibid, p. 51.

specific styles of defensive orientation, warfare and strategy, with putting the impact of these factors in a broader social context. Such an approach allows for strategic culture to be viewed as a result of three groups of sources: natural, political, and socio-cultural. When it comes to natural resources group, the impact of geography, climate and natural resources is stated. In the political groups of sources, historical experience, political system and belief of elite is pointed out. Myths, symbols and written testimonials are aspects of the socio-cultural group of sources of strategic cultural identity.[28]

Durability, accuracy and continuity of a certain type of behavior are the essence of strategic culture and offer the framework of strategic thinking. Therefore, it is considered that culture is an important aspect of the success or failure of policy or strategy.

STRATEGY OF STATE – THE HIGHEST LEVEL OF STRATEGIC THINKING

The classical concept of strategy has undergone fundamental changes, and the range of strategic thinking in modern conditions is much wider. Generally, from the military term that was primarily focused on the management of the armed forces during the war, strategy has become the skill and knowledge that outgrew the war and began to embrace all the complexity of the reality, focusing not only on the period of war, but the period of peace, as well. The totality of war created the need for the state, in achieving the objectives of national security policy, to rely not only on the military factors, but on the total power of the society. By this, strategy focuses on the application and direction of all source of power of a political community in order to achieve the highest political goals. Thus, strategy has gone beyond the frames of authentic military activity.

The term strategy of the state is more recent concept. The most frequent term used for this are general strategy, global strategy, total strategy, national strategy, general strategy. What is common to all these concepts is that they deal with fundamental issues of national policy. The idea of the strategy of the state can be found in Sun Tzu Wu who conceived the history of strategic thinking. With his position that there is only one general strategy and that all others are special, he suggested significance of non-military strategies. He was emphatic in his belief that the acme of skill is to overcome the enemy without fighting. Classifying strategy as the total, general and others, Beaufre talks about strategy from the perspective of the function of society and the state[29].

What makes the idea Strategy of the state or Grand strategy new is the fact that its content and scope do not refer only to war and the sphere of defense, but also to the implementation of all government functions in peace and war.[30] It is clearly indicated that the development of strategies was going from the inner to the broader concept, or from the concept of strategy which is focused on the mere application of force to the strategy that use force because of the goals set by the policy. Hart says that when "strategy goes further and provides for the use of all sources of power in a society to achieve goals that go beyond just the outcome of the war, but also deals with the relationship of the upcoming peace, that is so-called Grand strategy".[31] This means that the Grand strategy is not focused only on the war but also on the peace, and the strategy understood in this way is not only the concept of war, it is an inherent element of all time.

In the strategic relations among states, the prevailing attitude is the attitude of strife[32], because certain forms of international politics show frightening continuity and duration[33], which means that globalization has not marked the end of history. Of course, the notion of conflict, which is the most persuasive evidence of the anarchic nature of international politics is more general than the notion of war, as it includes a state of peace, and from the standpoint of

28 Dragan Simić, ibid, p. 183.
29 Mitar, Kovač, *Стратегијска и доктринарна документа националне безбедност*, „Свет књига", Belgrade, 2003, p. 18.
30 Mitar, Kovač, ibid, p. 26.
31 Dragan, Simić, ibid, p. 150.
32 Dušan Višnjić, ibid, p. 14.
33 Kenneth, Waltz, *Theory of International Politics,* Centar za civilno-vojne odnose, Belgrade, 2006, p. 76.

the interests of the state as a stakeholder of strategic relationships, significantly defined not only war but peace strategies. "If "war" is the greatest challenge for the state, we cannot live spontaneously in "peace" either, if we do not think and act strategically, that is, if fundamental internal and external relations of a country are not controlled adequately and if they are inappropriately directed".[34] In a way, peaceful strategy precedes war strategy, and its failures carry huge consequences. Of course, the actual revolutionary change in the great transformation of the war, where the totality of the war is expressed through complete confrontation of different parties, requires a total strategy in which such a war cannot be the exclusive jurisdiction of the military, but, above all, the state.

Reaching and the protection of national and state interests in the coming century is followed by unpredictability of strategic relations between states, which reduces the reliability and effectiveness of the tools that are available to them. Hence, the need to theoretically establish the strategy of the state is caused by the complexity and ambivalence of global processes and the need to dispose of reliable predictions of how it would be possible to provide rational and efficient operation of the state and its subsystems in the future.[35] Thus, the achievement of the objectives of the national policy put national strategy in the limelight of strategic thinking, with the overall purpose to integrate all the factors of national power to ensure security in an unsafe environment.

The strategy of the state entails not only the art and science but also program standpoint which is based on the strategic skills that are necessary for the implementation of all government functions. Its initial postulates are national interest, national objectives and specific and individual strategies. Therefore, state strategy should reliably determine the highest good, values and interests, and to offer a clear idea of how to engage and guide political, economic and military tools for their protection. It is particularly important that the strategy of the state deals with projection of strategic relations and considers all the structural elements in the function of the future, bearing in mind the ongoing cognitive and empirical assumptions. Therefore, state strategy is a general and integrated program standpoint of conservation and achieving the highest national values and interests, with the involvement of mental, spiritual and material resources of the state for the purpose of safeguarding and successful development, through the achievement of defined objectives in peace and war[36].

The term strategy of the state, as a conceptual understanding of a program standpoint that includes specific forces and means to protect the highest values of state implies the manifestation of government functions in all the spheres of social life that are important for the protection of the highest state values. Therefore, poly strategic approach is necessary to protect national interests, where the strategy of the state is perceived as a basic strategic concept all the other strategies are derived from. A lot of general in general strategy (state strategy) are all special and individual strategies of poly strategic state system.[37] It means that state strategy should include foreign political strategy, military strategy, civilian strategy, economic and financial strategy, information strategy...

War is the result of policy of the people or lack of policy.[38] That is why the highest goal of the strategy of the state, as a totality of strategic reality of the state, is maintaining or achieving peace. The main purpose of state strategy, therefore, is to project conceptual and strategic preparedness and thereby eliminate the risk that strategic problems are solved only when they occur. In order to accomplish such a mission, the strategy of the state must be the highest level of strategic reasoning that will be based on rationally based strategic knowledge on all relevant aspects of the strategic environment and should define the values of the state, national and international security objectives and develop and use national resources to achieve them. It means that the strategy of the state, as a specific way of thinking, must associate the policy and strategy and thus create prerequisites that provide the greatest chance for success in the preservation of national values and interests. [39]

34 Dušan, Višnjić, ibid, p. 15.
35 Mitar, Kovač, ibid, p. 20.
36 Mitar Kovač, ibid, p. 26.
37 Dušan Višnjić, ibid, p. 22.
38 E. Mead, Earle, *Makers of Modern Strategy*,"Kultura", Belgrade, 1952, p. 1.
39 E .Mead Earle, ibid, p. 3.

CONCLUSION

Consideration of strategic reality remains important requirement in modern societies in search of appropriate responses to the challenges posed by systemically unregulated global society. Such strategic context in which conflicts are the dominant forms of international politics requires continuous systemic effort of theoretical and practical reason to avoid randomness in the existence of a political community and neutralize the power of all those tendencies that threaten its foundations.

Protection of national interests and objectives put the strategy of the state in the center of attention of strategic thinking and on the highest level of national considerations of strategic reality of a political community. Full theoretical foundation of the state strategy, formulating of which implies the engagement of leading intellectual and spiritual potential of an entity is the obligation of particular importance in defining the key prerequisites for the survival and development of the society and the nation.

It is quite reasonable to say that great and powerful states behave comfortably in international politics – they can make mistakes without much suffering. Small countries, however, are living a very dangerous life as their mistakes often have a high price. Just because of that, small countries have to behave as properly as they can and extremely carefully project their policy on the international scene.[40] This is where strategic thinking should have a special place.

REFERENCES

[1]. Bajagić Mladen, *Medjunarodna bezbednost*, KPA, Belgrade, 2012.
[2]. Beaufre Andre, *Introduction to Strategy,* VIZ, Belgrade, 1968.
[3]. Beck Urlich*, Risk Society*,"Filip Višnjić", Belgrade, 2001.
[4]. Colin S. Gray, *Out of the Wilderness: Prime Time for Strategic Culture*, Nuclear Strategy Forum, 2006.
[5]. Colin S. Gray, "Strategic Culture as Context: The First Generation of Theory Strikes Back". Review of International Studies, 1999.
[6]. Huntington, Samuel, *The Clash of Civilizations*, CID, Podgorica, 2000.
[7]. E. Mead Earle, *Makers of Modern Strategy*,"Kultura", Belgrade, 1952.
[8]. Ermarth, W. Fritz, „Russia's Strategic Culture: Past, Present, and… in transition?" Defense Threat Reduction Agency Advanced Systems and Concepts Office, Comparative Strategic Cultures Curriculum, 2006.
[9]. Kenneth Waltz*, Theory of International Politics*, Centar za civilno-vojne odnose, Belgrade, 2006.
[10]. Kennedy Robert, "The Elements of Strategic Thinking", *Teaching Strategy: Challenge and Response*, Strategic Studies Institute, U.S. Army War College.
[11]. Kovač Mitar, *Strategijska i doktrinarna dokumenta nacionalne bezbednosti*, „Svet knjige", Belgrade, 2003.
[12]. Krstić Zoran, Grozdić Borislav, „Kosovski zavet i srpska strateška kultura", Zenit, Belgrade, 12/ 2012
[13]. Lantis S. Jeffrey, „Strategic culture: From Clausewitz to Constructivism", Defense Threat Reduction Agency, USA, SAIC, 2006.
[14]. Martin van Creveld , *The Transformation of War,* „Službeni glasnik", Faculty of Security, Belgrade, 2010.
[15]. Mandelbaum Michael*, The Ideas that conquered The World,"* Filip Višnjić", Belgrade, 2004
[16]. Mijalković Saša, *Nacionalna bezbednost*, KPA, Belgrade, 2009.
[17]. Simić Dragan, *Svetska politika, međudržavni i međunarodni poredak, svetska politika i globalni odnosi*, „Čigoja štampa", Belgrade, 2009.
[18]. Simić Dragan, *Nauka o bezbednosti*, „Službeni list SRJ", Belgrade, 2002.
[19]. Stojanović Stanislav, *Globalizacija i bezbednosne perspektive sveta*,VIZ, Belgrade, 2009.

40 Kenneth Waltz, ibid, p. 214

[20]. Sun Tzu Wu, *The Art of War* Mono i Manjana, Belgrade, 2009.
[21]. T.G. Mahnken, J.A.Maiolo, *Strategic Studies,* Routledge, New York, 2008.
[22]. Višnjić Dušan, *Strategija države kao sudbina nacije*, VIZ, Belgrade, 2006.

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SECURITY MANAGEMENT AND THE ROLE OF THE MANAGER IN THE SECURITY SECTOR

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Abstract: Management, as a modern conception, is an organized, systematic and continuous process of using organizational resources for effectively and efficiently achieving organizational goals through proper planning, organizing, leading and control. In the contemporary theory and practice of organization and management - and lately of security - the term "management" is increasingly used as a full substitute for the term leading or running and managing security institutions.

In essence, the security management with its specific activities is responsible for the implementation of security features through which it maintains the required level of security, while relying on the legitimate use of force and adhering to strict ethical and professional standards. In addition, security management focuses on finding appropriate solutions to specific security problems and solving specific security situations. This paper shall focus on some specific features of the place and role of the security manager for the purpose of efficient and effective execution of the activities in the security sector.

Key words: management, security management, manager, security sector.

GENERAL REMARKS ON THE TERM AND MEANING OF MANAGEMENT

In the contemporary theory and practice of organization and management - and lately of security - the term "management" is increasingly used as a full substitute for the term leading or running.[1]

Management as a concept and as a scientific discipline is very complex and multidisciplinary and it can be analyzed from different perspectives. As a complex term it can have different meanings, so in its defining by many authors there are different approaches and some ambiguities that derive mainly due to incomplete and partial approach to this issue. Therefore there is still no single, universal and generally accepted definition of management[2]. Due to the length limitation of this paper, a more comprehensive elaboration of the numerous authors and their theoretical approaches and definitions could not be done here. However, from the analysis of the broader literature in this field, one general definition can be synthesized according to which *"management represents a universal and dynamic process of effective execution of work with the help of other people and engagement of resources in achieving the predefined goals of the undertaking (institution)"*[3]. Hence, four elements that characterize the contemporary management have been clearly differentiated: 1) it is a process that encompasses: planning, organizing, coordinating, motivating and control; 2) allocation and use of resources such as: raw materials, machinery, markets and money; 3) effective and efficient execution of work by other people; and 4) accomplishment of pre-set goals.

The organization/institution is a sum of people who work together and coordinate their activities for the purpose of achieving wide diversity of their goals or future desired results. The organizational *resources* include people and their skills, know-how and experience; machinery; raw materials; computers and information technology; and patents, financial capital and loyal clients and employees. The manager is a person responsible for supervision of utilization of organizational resources for achieving its goals.[4]

1 For further information please see: Bakreski, O. Bases of the Security Management, Faculty of Philosophy – Skopje, 2011, page 19.
2 For further information please see: Danicic M, Security Management, Faculty of Security and Protection, Banja Luka, 2010, pages 23-27.
3 Suklev, B., Management, Faculty of Economics, Skopje, 1993-2004 page 5.
4 Gareth R.Jones and Jennifer M.George, Contemporary Management – Global Communications, 2008, Skopje, pages 5-10; Gabriela Rakicevic, Human Resources Management, Faculty of Tourism and Hospitality, Ohrid, 2007, pages 7-10.

THE TERM OF SECURITY MANAGEMENT AND ITS ROLE IN THE SECURITY INSTITUTIONS

Basically, it can be said that there are as many different management disciplines as there are different areas in life and work. For example, the management implemented in finances is called financial management, in politics – political management, in education – educational management, in security – security management etc. In fact, the basic methods of management are implemented in all areas of peoples' work and activity, while the special methods and techniques of management are implemented in every organization/institution, depending on its specifics.[5] For example, in order for the security management to ensure the necessary vitality of the army and police, as well as the private companies and agencies for security of property and persons, it uses such specific methods and techniques that may increase the efficiency of their work in the best possible way.

The security management as a relatively new concept concerns issues connected to management of security institutions[6] and it is simply defined as management with the security sector (army, police, intelligence services, security agencies, private companies etc.), for ensuring the interests of the state, citizens and property from different forms of threats, risks and dangers.

Besides the stated reasoning, different opinions, approaches and conclusions regarding security management may be found in the literature. For example, according to Horowitz, the security management aims at establishment of good control, preparation of contingency programs and evacuation plans, as well as their effectuation in case of danger during minor disturbances as well as larger catastrophes[7]. Further, Ortmeier defines the security management as a necessary management tool for achieving the security goals of the organization[8]. Fay considers that the security management is a service of public nature with a task to improve the operation of security institutions and to secure protection of specific persons or organizations[9]. Sennewald and Sanger indicate that the security management includes all organizations that provide services related to security of individuals or of objects with a goal to protect the individuals and private property or other interests from different risks and threats[10]. According to Vejnovic, the security guidance or security management as a whole represents a sum of measures, activities and management of actions aiming at warning, preventing and organizing of protection in case of accidental or intentional causing of endangerment[11]. Kekovic considers that the security management is adapted towards achieving and protecting public interests, i.e. the security management also includes certain security and safety procedures by which the elements of the system are brought into functional dependency in order to predict, warn and remove modern security risks and threats[12]. Kesetovic defines security management as decision-making regarding the security goals of the organizational system, the manners and means by which security adverse impacts coming from the surroundings or the organizational system itself would be avoided or their harmful impact would be reduced[13]. According to Danicic, the security management represents resource management directed towards achieving determined security goals[14], while Dragisic considers that the security management contributes to avoiding unfavourable situations or minimizing the damage thereof[15].

Some of the aforementioned definitions are wider while some are much narrower in their view, considering the safety management in the light of implementation of security programs or achievement of security goals. In that context, Brian considers that the security management is in function

5 Dragisic, Z., Security Management, Official Gazette and University of Belgrade and Faculty of Security, Belgrade, 2007, page 14.
6 Gazemier J.A. Overbeek P.L. and Louk M.P, Security Management Stationery Office, 2005, pages 34-123.
7 Horowitz S. A Different Order of Magnitude in Security Management 45(10).2001,page 8, Brain R.Jonson, Principles of Security Management, Pearson Prentice Hall, 2004, page 9.
8 Ortmeier P.J., Security Management: An Introduction, Prentice Hall, 2004, pages 20-134.
9 Fay John, Contemporary Security Management, Elsevier Science & Technology Books, 2005, pages 13-78.
10 Sennewald Ch.A. and Sanger Jh., Effective Security Management, Elsevier Science & Technology Books, 2003.
11 Vejnovic, D., Directions and Domains of Security Management, Defendology, Banja Luka, December 2002, Year V, Number 11-12, page 65.
12 Kekovic, Z., Security Management and Protection from Terrorism in the Collection of Papers – Terrorism in Modern Conditions, High Internal Affairs School, Banja Luka, 2003, pages 247-254.
13 Kesetovic, Z., Crisis Management, Official Journal, Faculty of Security, Belgrade, 2008, page 80.
14 Danicic, M., Security Management, Faculty of Security and Protection, Banja Luka, 2010, page 108.
15 Dragisic,Z., Security Management, Official Gazette and University of Belgrade – Faculty of Security, Belgrade 2007, page 14.

of implementing every successful security program and this requires a proper administration and a good management in the organization[16].

From the definitions listed, one may have the impression that the term security management lacks a concise definition. Defining this term is difficult because the genuine nature and scope of the security management field is difficult to be determined. Also, defining is difficult since several aspect roles that the security management has in the security institutions are encountered, despite the fact that some roles may be defined as performance of certain security functions while others are not classified and are not considered as security services. For example, individuals employed in the field of informatics security may be classified as informatics technology specialists or as security specialists depending on their detailed job description as well as the philosophy and position the company has regarding the security function.

The general conclusion is that the field of security management is quite extensive, dynamic and diverse and that it should be constantly expanded in order for the security processes, conditions and needs to be timely identified, the dangers, threats and risks be prevented and all resources be optimally used in achieving the security goals and tasks of the institution/organization. In this respect, Bakreski[17] points out that the security management is a consecutive implementation of certain position on the processes and conditions that the security institution must face, as well as determining the manners of actions which represents relevancy, identification of problems, detailed elaboration of connections, efficiency and continuity.

MANAGEMENT IN THE SECURITY INSTITUTIONS

In essence, the place and role of the security management in the security institution is determined by its function and tasks that it needs to achieve. The main function of the security management is assessing the actual and potential security threat and risk; taking measures for elimination of dangers; establishing an organization that will be capable to face all forms of threats; control over implemented measures and functioning of the security system; providing information to the top managers of the security institution or to the political leadership; preparing security analyses and guarantying complete security to all employees[18].

The contemporary theory for design of the organization respects the role and significance of the security as a separate but not isolated function of the management, since the need for security is vested in all parts of one organization i.e. institution. Management of every part of the organization/institution means the analysis of the security threat to the basic function and design of measures for removal of security threats to the given functions of such organization. The security management of the separate functions of the organization, in case there are no specific security threats or threats to important functions, is incorporated in the general operational organizational units and constitutes a part of the general organization. On the level of operational management, the security function is incorporated in the general principles of operation of the organization and it is not set up as a separate organizational unit, but it is directed towards implementation of security measures and procedures as part of the operational strategic plans of the top managers.

The security management as a science established for several decades and has certain implementation of different methods in the organization and planning of the responsible bodies and subjects in the security sector. Actually, the security sector (security community) today, apart from the traditional parts (army and police) encompass also all other state bodies authorized to carry and use arms i.e. use force: border units, intelligence services, special antiterrorist units, financial, customs and forestry police, court and prison services as well as formations (agencies) that derived from the current privatization as parts of the security sector and armed forces[19]. In the army, the term management is used for activities connected with management and leadership. With these management-functions in the army an unusually high organizational action is achieved, in which

16 Brian R. Johnson, Principles of Security Management, Pearson Prentice Hall, 2004, pages 9-28.
17 For further information please see: Bakreski O, quoted paper page 63.
18 Brian R. Johnson, Principles of Security Management, Pearson Prentice Hall, 2004, pages 9-28.
19 For further information please see: Damian, Lilly D. and Page T.,(eds), Security Sector Reform: The Challenges and Opportunities of the Privatization of Security, International Alert, London, 2002; Murgoski B., Some Aspects of the Reforms in the Police and Police Educational System, Modern Macedonian Defense, Ministry of Defense of RM, No.13/2006, pages 153-169; Bakreski O., Control of the Security System, Faculty of Philosophy, Skopje, pages 8-18.

the individual who is in charge of command has wide, even absolute authorizations, since he in fact makes arbitrary decisions for the lives and physical integrity of his subordinates. Experiences gained by management, leadership and commanding with the army have transferred to other organizations as well and their theoretical shaping has commenced since the 20th century. Actually, the military sciences throughout history have dealt with the issues of organization of the army and increasing the efficiency, today otherwise known as military management[20]. Furthermore, the police play a crucial political role in every society due to the structural position in the state-society relations, the scope of their activities, the manner of performing their duties, and the symbolic presentation of their activities and influence in the social discourses[21]. For the purpose of playing a role as an executive body of the government, the police perform a number of functions. Consequently, the police management is carried out by the functions through which the police work is done and is directed towards introduction of new and contemporary forms of police-organizational management and functioning.

Among authors who deal with issues of security and management, there is inconsistent position regarding the military and the police management. Most of the authors consider that in the military and police there is only leadership, while management is more directed towards civil institutions, although in military and police logistics there can be discussion about management. According to Jurina, in order for one to be able to talk about police management, it is necessary that the surroundings in which the police act be changed; the police organization itself is also to be changed and it is vital to drastically change the system of leadership[22].

As I have previously stated, today the security management is present not only in the formal public institutions but also in the private security companies. The private security management encompasses the activities of the private security agencies for security of persons and property, the private military-security companies etc. which in a certain way provide security services and different forms of protection which they organize in order to help the citizens with their protection and the protection of their property.

It is also known that the management of the private security is one of the subsystems of the security system and therefore it is very important that it should be integrated in the managerial processes and structures in the security community itself.

In general, no matter if the security management is practiced in a public or private security institution, it should to a great extent correspond to the security culture, which represents a part of the general and organizational culture.

The introduction of the security management in an institution represents a consequence of the exposure to threats which can endanger the functioning and the survival of the institution and the state as a whole which represents an expression of the security culture of the top managers. However, the functioning of the security procedures at the level of organizational unit i.e. operational management represents part of the general security culture of a social environment and it depends in total of the measures and activities that are entailed in the strategic managerial organization[23].

Basically, every institution/organization has its own culture by which it is differentiated and by which it is recognized. The essence of the culture of the organization is to recognize inside the organization the values, norms and beliefs which the employees and the organization accept as their own and by which the organization shall be recognized and differentiated from the outside surrounding. The acceptance of the internal system of values represents a basic condition for *loyalty* towards the institution/organization, which is in turn based on the responsible and professional behaviour of the employees. The behaviour of all levels of management towards the employees is reflected on the behaviour of the employees and their acceptance or not acceptance of the values which in the end makes up the identity[24]. The security culture is based on loyalty of the employees

20 Danicic, M., Security Management, Faculty of Security and Protection, Banja Luka, 2010, page 114.
21 Shearing C., Reinventing policing: Policing as Governance, In Marenin, O.(ed.) Policing Change: Changing Police: International Perspectives, New York: Garland,1996, pages 309-330.
22 Jurina M. And others. Elements of the Police Organization, MIA Republic of Croatia, Police Academy, Zagreb, 1999, page 224.
23 Dragisic,Z., Security Management, Official Gazette and the University in Belgrade-Faculty of Security, Belgrade 2007, page 15.
24 Idem, pages 15-16.

to perform the tasks. The conscientious performance of the tasks means performing the tasks with full dedication and with the necessary awareness for the goals of the institution/organization and for the relationship of the involved subjects in the fulfilment of the planned assignments.

GOALS AND TASKS OF SECURITY MANAGEMENT

In principle, security management is in the function of fulfilling the goals that the security institution has set before itself. Hence, the efficiency and effectiveness of the security management in the security institution is often seen from the aspect of achieving of the set goals. The goals of the security institutions are often changeable and it is considered that one goal produces another and the second one initiate's a third and etc.

In general, the goals of the security management can be divided in two groups, general and specific goals. [25]

The general goals of security management are directed towards the protection of the fundamental and vital values of the state, ensuring the required level of security, implementation of national security policy, protection of the interest of citizens and their property etc.

The specific goals of security management are directed towards harmonization of the functioning of the elements of the system, ensuring the necessary synchronization of the activities in the institution, harmonization of the needs with the actual capabilities, creation of work conditions in the institution itself, motivation of the employees to complete tasks, ensuring the necessary level of interpersonal relations and so on.

The principal task of security management is the protection of the vital values of the state, improvement and development of the institution as well as achieving their goals. Also, the principal task of security management is to manage and organize the work of the institution itself,[26] but also, to focus on minimization of the danger and challenges that one institution can face as a whole or just certain parts of it.

Two essential elements should be taken into consideration in the process of management, the manner of forming the tasks and the management with the tasks. The *forming* means introduction of creations in which the operational activities shall take their place. The forming of the tasks contributes to the creation of conditions which will provide for accomplishment of the goals (for example: building and designing an organizational structure, structuring of tasks, establishing procedures, designing necessary channels for cooperation and communication and setting ways of consultation and participation). The forming of tasks is connected to proactive capabilities like prediction, planning and organizing[27]. On the other hand, *management* with the tasks encompasses stimulating the work, setting the management in the direction in which the job needs to be done and if necessary check of the completed tasks.

ROLE RESPONSIBILITY AND SUCCESSFULNESS OF THE MANAGER IN THE SECURITY SECTOR

There is no doubt that the security sector faces a number of challenges today. In analogy, a contemporary manager is needed, who needs to possess versatile skills and capabilities in order to answer to the contemporary challenges.

The knowledge that the managerial team in the security sector needs to posses must be combined such as: knowledge of basic organizational laws; knowledge of the ambient in which the institution is; what the wider community expects of the institution itself, etc.

25 Bakerski O., quoted paper, page 67.
26 Vejnovic D.- Directions and Domains of Security Management, in the magazine "Defendology", Banja Luka, December 2002, year V, No. 11-12, page 65.
27 Keuning D., Management, Person Professional Limited, 1998 pages 23-39.

The general theoretical assumptions stipulate that the capabilities of the managers in the security sector (holders of certain managerial functions) are grouped in several groups: technical, human, conceptual, analytical and decision-making capability[28].

Technical capability of the manager in the security sector is connected to a wide range of capabilities such as: capability to prepare analysis, plans, strategies, projections, capability to manage technical systems, capability to be actively involved in the particular field, capability of critical reasoning of the issues, capability of managing the institution, etc.

Human capability of the manager in the security sector entails: capability to lead and control the activities, capability to pass the information from top down and bottom up, capability to maintain inside and outside contacts, capability to organize the activities and motivate the employees, capability to plan and to report, capability to create a working environment, capability for reasoning, communicating and noticing the differences among the people, capability for overcoming conflict situations among people, capability for independent work and work in an interdisciplinary team, capability for visionary and creating of new activities, rhetorical and analytical capability, etc.

Conceptual capability of the manager in the security sector is expressed by: capability to insure a greater cohesion of the system, capability to identify the position of the institution in the surroundings, capability for strengthening of the institutional capacities, capability for providing structural and functional unity, capability for realization of organizational goals, capability for adaptation to new situations, capability for planning of activities.

Analytical capability of the manager in the security sector means: capability for diagnostics, capability for establishing interdependence and intensity of phenomena, capability for identification of possible threats to security, for analysis of internal and external factors for endangering the safety, for the global processes and their effects on security, for preparation of safety assessments, for analysis of the security situation, etc.

Decision-making capability of the manager in the security sector is expressed by the following capabilities: capability for selection of priority tasks, for recognizing rational matters, for distinguishing the important from the less important, capability for selectivity and systematic capability, capability to have the power for making decisions and to have the capacity for decision making, capability for making operational, timely, authoritative and rational decisions, etc.

Responsibility as a category has always accompanied the process of labour and the intensity of the responsibility has depended on the complexity of the work functions which a certain person has performed. Hence, the managerial function, which is very complex and responsible for the accomplishment of the set goals of every subject, carries a concrete and high responsibility of the people who perform it.[29].

Basically, the responsibility can be seen as: 1) responsibility dependant on others, 2) responsibility for the working conditions, 3) responsibility for collecting and transferring information and 4) as responsibility for decision-making. According to this, if one attempts to define the responsibility of the manager in security institutions, it can be systemized in several fields which are: the manager is responsible for establishing long term goals and tasks which should be at the same time achievable and a challenge to him and the institution as a whole; the manager needs to have power and capability with his vision to challenge all members of the collective to accept his vision as a realistic and achievable; the manager is responsible for the formulation of the plans and programs for work whose execution, in the end, will lead to accomplishing the globally set goals of the institution; the manager is responsible for creation of appealing interpersonal relations, for overcoming possible conflicts which arise from the program for accomplishing the set goals; the manager as a kind of a leader of the institution is responsible for selection, promotion, motivation and a fair treatment of the employees in the collective; the manager is responsible for creation of a positive atmosphere among the employees in the institution, and that will somewhat impact the loyalty of the employees towards the institution, employees which are ready for hard work and dedication towards the institution which should lead to certain success; the manager, together with his team, is responsible for the performance of all activities in the institution; the manager is responsible for the set up and

28 Goceski T., Educational Management, Makedonska Riznica, Kumanovo, 2003, page 191-202; Bakreski O. Basics of Security Management, pages 75-83.

29 Goceski T., quoted paper page 193; Bakreski O. quoted paper pages 80-81.

compliance with the standards in the work and the behaviour of the employees; the manager is responsible for the establishment of the strategy for long term development of the institution, as for its execution.

The literature provides for a systematization of the qualities that the successful manager should possess. This systematization is applicable to a large extent to the managerial top in the security institutions. According to this systematization, the most important qualities are[30]: the successful manager should be capable to think and reason so that he can make a decision quickly and efficiently, to act, to execute, etc; the manager should express himself clearly so that he can perform his function in communication; the manager should possess certain technical knowledge and capabilities; the successful manager should think wider than the others so he can see the effects of all assignments and processes that are undertaken; the manager should be able to exchange ideas, information, knowledge and opinions with the other people in the managerial team; the successful manager should have a moral integrity with which he can earn trust among the subordinates and among the ones he communicates with; the manager should possess organizational skills; the manager should be a dynamic person, prepared to introduce novelties, changes, innovations, etc; the manager should be an emotionally stable person who can leave his personal feelings outside the office; a manager ready for establishing the best interpersonal relations, to bring enthusiasm, to motivate, etc.

CONCLUSIONS AND RECOMMENDATIONS

Management as a contemporary conception is an organized, systematic and continuous process of using the organizational resources for efficient and effective achievement of the organizational goals by adequate planning, organizing, leading and control. Security management as a relatively new concept regards issues connected with management of the security sector and security institutions in order to protect the interests of the state, citizens and property from different forms of endangerment, risks and dangers.

The basic function of security management is accessing the actual and the potential security threats and security risks, undertaking measures for elimination of dangers, setting up of an organization which will be able to deal with all forms of threats, exert control over the executed measures and the functioning of the security system, while providing information to the top managers of the security institution or the political leadership, as well as preparing security analyses and ensuring perfect safety for all employees.

In that sense, I believe that managers in the security sector should be persons who have all positive human and ethical characteristics, that they should be educated regarding scientific facts and possess professional qualifications, technical training and competences for the appropriate field of security. These are important prerequisites for efficient and effective management and responsible use of organizational resources for accomplishing the social and institutional security goals and tasks.

REFERENCES

1. Bakreski O., Basics of Security Management, Faculty of Philosophy - Skopje, 2011;
2. Brian R.Johnson, Principles of Security Management, Pearson Prentice Hall, 2004;
3. Damian, Lilly D. and Page T.,(eds), Security Sector Reform: The Challenges and Opportunities of the Privatization of Security, International Alert, London, 2002;
4. Danicic M., Security Management, Faculty of Security and Protection, Banja Luka, 2007;
5. Danicic M., Security Management, Faculty of Security and Protection, Banja Luka, 2010;
6. Dragisic Z., Security Management, Official Gazette and Belgrade University- Faculty of Security, Belgrade, 2007.
7. Fay John, Contemporary Security Management, Elsevier Science & Technology Books, 2005;

30 According to: Bakreski O. quoted paper pages 81-82.

8. Gareth R. Jones and Jennifer M. George, Contemporary Management-Global Communications, Skopje, 2008;
9. Gazemier J.A. Overbeek P.L. and Louk M.P, Security Management Stationery Office, 2005, pages 34-123;
10. Goceski T. Educational Management, Makedonska Riznica, Kumanovo, 2003;
11. Horowitz S., A Different Order of Magnitude, in Security Management 45(10).2001;
12. Jurina M. and others, Elements of Police Organization, MIA of Republic of Croatia, Police Academy, Zagreb, 1999;
13. Kekovic, Z., Security Management and Protection form Terrorism, Collection of Papers- Terrorism in the Contemporary Conditions, High Interior Affairs School, Banja Luka, 2003;
14. Kesetovic, Z, Crisis Management, Official Gazette, Faculty of Security, Belgrade, 2008;
15. Keuning D., Management, Person Professional Limited, 1998.pages.23-39;
16. Murgoski B., Certain Aspects of Reforms in the Police and in the Educational System of the Police, Contemporary Macedonian Defence, Ministry of Defence of the Republic of Macedonia, No. 13/2006;
17. Ortmeier P.J., Security Management: An Introduction, Prentice Hall, 2004;
18. Rakicevic G., Management of Human Resources, Faculty of Tourism and Hospitality, Ohrid, 2007;
19. Sennewald Ch.A. and Sanger Jh., Effective Security Management, Elsevier Science & Technology Books, 2003;
20. Shearing C., Reinventing policing: Policing as Governance, In Marenin,O.(ed.) Policing Change: Changing Police: International Perspectives, New York: Garland,1996;
21. Shuklev B., Management, Faculty of Economics, Skopje, 2005;
22. Vejnovic D., Directions and Domains of Security Management, Defendology, Banja Luka, December 2002, Year V, No. 11-12;

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SHADOW ECONOMY WITH THE OVERVIEW OF THE SITUATION IN MACEDONIA

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Abstract: One of the basic measurements for growth and performances of economy is gross domestic product, which is defined as total market value of all finished goods and services in one country for a period (usually one year). GDP is taking in consideration only finished goods and services, but some part of production is trying to be hidden. Hidden part of production is part of informal economy and is known as shadow economy. Consumers and manufacturers have major role in shadow economy.

The purpose of this paper is to present the most widely used methods for measurement of shadow economy and to present the situation of shadow economy in Macedonia.

In this paper, analyses for informal economy are made in accordance to the OECD Handbook "Measuring the Non-Observed Economy" (2002). Namely, OECD determines that there are seven reasons, categorized into three main areas: (i) underground production, (ii) informal production and (iii) illegal production.

According to the results of analyses, about 70 thousand people in Macedonia works in informal economy and they are registered as unemployed persons. From those results we can see that movement of shadow economy in Macedonia has decreasing rate, i.e. around 30% from GDP in 2000 compared to 2010, where is 24%.

All economic experts has shared opinion that shadow economy, on the one hand, nourishes social peace in the states, and on the other hand, it is good to think of decreasing it in Macedonia because it covers a big portion of GDP. Some of reasons for such a high rate of shadow economy in Macedonia are: on the first place unemployment, social contribution, tax rates etc.

Despite some government activities aimed at reducing shadow economy, this issue still has very high rate.

In this paper, the authors will offer some directions and forms for decreasing of shadow economy through improving tax payments from tax payers (VAT, personal income tax, profit tax, property tax, and transfer tax), high level control, high control in registering of employees in companies and so on.

Keywords: shadow economy, methods, social peace, tax, control.

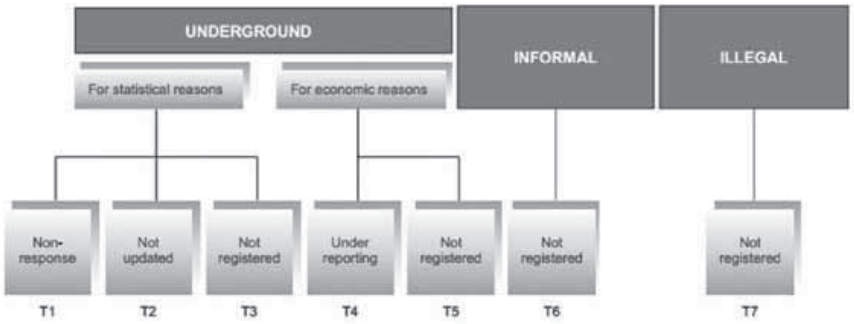
INTRODUCTION

The shadow economy includes those economic activities and the income derived thereof that circumvent or avoid government regulation or taxation. The major component (about two thirds) is undeclared work, which refers to the wages that workers and business do not declare only to avoid taxes or documentation. The rest is represented by business underreporting profits to avoid tax regulation.[1] According to the OECD handbook "Measuring the Non-Observed Economy"[2] (2002), "the groups of activities most likely to be non-observed are those that are underground, illegal, informal sector, or undertaken by households for their own final use", together with the deficiencies of data collection "are collectively said to comprise the non-observed economy (NOE)". According to the same source, the non-observed economy is occurring due to seven reasons, categorized into three main areas: (i) underground production, (ii) informal production and (iii) illegal production. The underground production is an area where the activities are not recorded due to economic

1 Schneider (2011), The Shadow Economy in Europe 2011.
2 http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/documents/OECD_nonobserved_economy_2002.pdf http://www.businessjournalz.org/articlepdf/BMR_1205.pdf.

reasons, such as tax avoidance, avoidance of social contributions, wages, work hours etc., and statistical reasons for not recording activity are lack of responsiveness, not updated data and difficulty of the statistical system to capture the changes especially in small sized production activities. The informal production refers to data missing due to lack of registration, which is usually not legally required, such as craftsmen, farmers, home workers, etc. The illegal production refers to activities involving production, sales and distribution of products/services, which are legally prohibited. Others (Startienė and Trimonis 2010) define the non-observed economy as "the secondary market with trade deals that would be possible in official economy but were taxed or would not be possible at all because of law".[3]

Figure 1 ISTAT framework for NOE



Source: OECD (2002)

Thus, the shadow economy is market-verified part of the legal economy that is done on illegal way. Actors of underground economy may opt for legal activity in hidden forms for different reasons. Schneider (2011) states four common reasons:

- First – evasion of value added tax or other taxes,
- Second – avoidance of contributions for insurance,
- 3rd – avoid application of regulatory standards (minimum wages, maximum working time, safety at work, etc.) and
- 4th – avoiding implementation of the prescribed administrative procedure (submission of statistical statements of operations).

Activities of underground economy of supply and demand affect the ruling concerning market. The only difference compared to the formal economy, is that relevant state institutions do not have access to a number of indicators that determine its scope.[4]

Table 1: Shadow economy (in % GDP)

State	1999/00	2001/02	2002/03	2003/04	2004/05
Argentina	25,4	27,1	28,9	28,6	27,2
Australia	14,3	14,1	13,5	13,1	12,8
Austria	9,8	10,6	10,9	10,1	9,3
Belgium	22,2	22,0	21,0	20,4	19,6
Bosnia and Herzegovina	34,1	35,4	36,7	36,2	35,3
Bulgaria	36,9	37,1	38,3	37,4	36,5
Burkina Faso	41,4	42,6	43,3	43,8	43,1
China	13,1	14,4	15,6	16,1	16,6

3 http://www.businessjournalz.org/articlepdf/BMR_1205.pdf.
4 Friedrich Schneider, The Shadow Economy in Germany: A Blessing or a Curse for the Official Economy?, Economic Analysis & Policy, Vol. 38. No. 1, March 2008, p. 90.

Croatia	33,4	34,2	35,4	34,7	34,1
Czech Republic	19,1	19,6	20,1	19,2	18,3
Denmark	18,0	17,9	17,3	16,7	16,1
Estonia	38,4	39,2	40,1	39,1	38,2
Finland	18,1	18,0	17,4	16,4	15,8
France	15,2	15,0	14,5	13,8	13,2
Germany	16,0	16,3	16,8	16,1	15,3
Greece	28,7	28,5	28,2	27,4	26,3
Hungary	25,1	25,7	26,2	25,3	24,3
Ireland	15,9	15,7	15,3	14,8	14,1
Italy	27,1	27,0	25,7	24,8	23,2
Japan	11,2	11,1	10,8	9,4	8,8
Latvia	39,9	40,7	41,3	40,4	39,4
Lithuania	30,3	31,4	32,6	31,3	30,2
Macedonia	34,1	35,1	36,3	36,8	36,9
The Netherlands	13,1	13,0	12,6	12,0	11,1
Poland	27,6	28,2	28,9	28,2	27,3
Portugal	22,7	22,5	21,9	21,1	20,4
Romania	34,4	36,1	37,4	36,2	35,4
The Russian Federation	46,1	47,5	48,7	48,2	47,3
Serbia and Montenegro	36,4	37,3	39,1	38,2	37,3
Singapore	13,1	13,4	13,7	13,0	12,1
Slovakia	18,9	19,3	20,2	19,1	18,2
Slovenia	27,1	28,3	29,4	28,2	27,3
Spain	22,7	22,5	22,0	21,2	20,5
Sweden	19,2	19,1	18,3	17,2	16,3
Switzerland	8,6	9,4	9,4	9,0	8,5
United Kingdom	12,7	12,5	12,2	11,7	10,3

Source: F. Schneider, Shadow Economies and Corruption all over the World: New Estimates for 145 Countries, 2007, p. 53.

If we take a look at international researches, midrange for the appearance of shadow economy clearly indicates that the presence of informal sector in the economy is not the exclusive right of just a few countries in the world. One will practically everywhere find a shadow economy, but really, in various forms, activities and especially scale. It is generally believed that in less developed countries the informal economy is more than in developed countries, which beautifully illustrate the various internationally oriented studies, for example, Schneider and Enste (2002), Schneider (2004, 2007b) and, finally, the one illustrating the table above. Although the phenomenon differs between countries, researchers are still to some extent uniform in terms of the root causes of the emergence and development of the shadow economy and the impact that it leaves in the economy.[5].

MEASURE OF SHADOW ECONOMY

The nature of shadow economy makes it "impossible" to be measured with certainty. However, there are numerous methods developed for estimating the size of the shadow economy. Commonly, the methods are classified in three groups:

(i) Direct methods, which are based on direct data, collected through surveys, observations and interviews with economic operators

(ii) Indirect methods which are endeavouring into determining the extent of the shadow economy by measuring "indicators" of macroeconomic data, such as the cash-deposit ratio approach, physical input, etc., and

5 Nastav B., Merjenje, vzroki in posledice siva ekonomija v Slovenija, Doktorska disertacija, Univerzitet v Ljubljana, Ekonomska Fakulteta, Ljubljana, 2009, p. 41.

(iii) Model approach based on the statistical theory of latent variables, which considers several causes and several indicators of the shadow economy.[6]

The direct method approach is not commonly used because its outcome and reliability highly depends on the willingness of the interviewees to reveal truthful answers, as well as the structure and form of the questionnaire. Thus, there are serious difficulties with estimating the actual size of the shadow economy with this approach.

The indirect method is estimating the size of the shadow economy based on measuring the differences between national expenditures and revenues, an assessment of the labor market analyzing the differences among the officially registered employment, the unemployment rate and the number of people who are actually employed within the economy[7]. The indirect method with currency demand approach[8] is used in the estimation of the shadow economy in OECD countries (Schneider, Johnson, and Kaufman, 1998). Another indirect method used by Kaufman and Kaliberda is the electricity consumption method[9], which will be the focus of this paper as well as the multiple indicators multiple causes (MIMIC) approach, which is structural modelling using the shadow economy as a latent variable considering several causes and indicators of the SE[10].

Method for Electricity Consumption

In the list of indirect methods, method of consumption of electricity sometimes is also called a method of physical input. This method is used by CEA in research paper for measurement of shadow economy in Macedonia. Like the other methods in the context of indirect methods, such differences also compare the evolution of two volumes, this time in the not directly comparable units. The method compares the actual consumption of electricity (physical unit) and the value of GDP (value units). The method has been mainly used for calculating the size of the informal economy in transition countries, because "... consumption of electricity (is) much better measure of real economic activity in Eastern Europe and the former Soviet Union, than any officially published economic statistics, most of which are in use ... "[11]

The assumption, on which this method is build, is that the overall economic growth activity (official and those in the informal economy) and the growth of electricity consumption move in constant proportion. The method was developed in the mid-1990 (Doboz (1995), and Pohl Doboz (1995), Koen (1995), Kaufmann and Kaliberda (1996)), and later adapted and used in different countries (Hutchins (1999), Kyle (2001), Feige & Urban (2003)). For Macedonia, unfortunately, the method in its basic form is not adequate and did not give understandable results (settings & Bojnec (2005)).

Nevertheless, the main method is very questionable assumption of movement of studied quantities: the time it is possible to improve the energy efficiency of technology and the relationship bursts, leading to erroneous estimates. Access to the data at the level of industries in many cases is impossible, which means a very limited computation of the informal economy.

Methods differ within the indirect methods, although each method again provides own assessment and also reflects a certain movement for some assumptions that can represent either the lower or upper limit. Similarly, the electricity consumption method necessary has to take into account changes in energy efficiency and intensity of study of the economy, so that he could score overestimated by this method.

This method is used by Kaufmann and Kaliberda (1996) where with replacement (base) measurement an estimate of unofficial GDP can be derived. This is a simple method and appealing

6 Shadow economy in R. Macedonia, Vesna Garvanlieva, MBA Vlatko Andonov, Marjan Nikolov, MSc, Center for Economic Analyses (CEA), October 2012, Open Society Institute Think Tank Fund Budapest ref. 6 ftp://ftp.econ.au.dk/afn/wp/03/wp03_07.pdf, p. 11.

7 Friedrich Schneider and Dominic Este, "Shadow Economies Around the World - Size, Causes, and Consequences, Max-Planck-Institute for Research into Economic Systems, 1999.

8 The currency demand approach has been used by Cagan (1958) and further developed by Vito Tanzi (1980¬1983).

9 Kaufman and Kaliberda, The Underground Economy in Poland, 1996.

10 Shadow economy in Macedonia,Vesna Garvanlieva, MBA Vlatko Andonov, Marjan Nikolov, MSc, Center for Economic Analyses (CEA), October 2012, Open Society Institute Think Tank Fund Budapest.

11 Doboz & Pohl, 1995, p. 18.

however, it is also criticized as: (i) not all shadow economy activities require a considerable amount of electricity and other energy sources can be used (gas, oil, coal, etc.) thus only a part of the shadow economy will be captured; (ii) the technical progress resulted with higher production and electricity efficiency compared to the past concerning both the official and the unofficial/shadow activity usage.

In the following text attempt will be made for implementation of the Kaufmann and Kaliberda electricity consumption to be used for estimation of the size of shadow economy in the Republic of Macedonia in the period between 2000 and 2010.[12]

The size of the shadow economy is derived as a difference between estimates for overall and official economic activities. In order to estimate the shadow economy the data for real GDP and the electricity consumption is collected. The base year for this estimation is 2000. The baseline year proxy for SE as percentage of GDP are former empirical estimate of Schneider estimating the SE in Macedonia in 2000 of 34,1% of the GDP.[13]

$$S_t = S_{t-1}\left(1 + \frac{1}{\mu} g_{Et} - g_{Yt}\right) = S_0 \prod_{i=1}^{t} * \left(1 + \frac{1}{\mu} g_{Ei} - g_{Yi}\right)$$

Where:

St is the shadow economy in year t

- 0 is the output in the shadow economy in base year
- Et is the annual growth rate of electricity power consumption
- Yt is the annual growth rate of GDP

μ is the output elasticity of electricity consumption.

POSITIVE AND NEGATIVE SIDES

Shadow economy appears and is seen in the public, especially by the state, as something undesirable and something that should be in any way eradicated. As will be shown below, informal economic activity can also have positive consequences that should be encouraged. Deciding between the positive and negative effects of the informal economy is largely determined by national strategy to combat the underground economy. If the positive effects outweigh the negative, it is understandable that there is no excessive momentum to prosecute such activities; opposite occurs in the case of dominance of negative consequences. Countries in this section differ one from another; in addition the cost of "eradication" of shadow economy is different, which is also a component of differentiation between countries in their strategies. The following sections are focused on the main negative and positive effects of the informal economy. Such an approach is beyond the aims and (data) frames of this thesis, in addition to the previous work in this regard was based largely on theoretical conclusions (see, for example, Schneider and Enste (2002, p. 155)).

Also, defining of positive or negative effects depends on the view and definitions used (good/bad) and the applied reference (welfare) model. Consequently, this phenomenon can be studied and analyzed in terms of public finances, in terms of morale, better (material) life of the people etc. Firstly, we will point out the most important outcomes that represent a negative side of the gray economy.

Among the negative effects of the informal economy, the first place takes the loss of tax revenue. Namely, informal economy results in loss of tax revenues, which means that decrease in funds which can be invested in infrastructure or another public asset and thereby increase welfare of citizens.

12 Klara Sabirianova Peter, Income tax flattening: Does it help to reduce the shadow economy? Georgia State University IZA Bonn, (kpeter@gsu.edu) January 17, 2008, p. 6.

13 Shadow economy in R. Macedonia, Vesna Garvanlieva, MBA Vlatko Andonov, Marjan Nikolov, MSc, Center for Economic Analyses (CEA), April, 2012, Open Society Institute Think Tank Fund Budapest.

Johnson et al. (1999) classified the negative effects of the informal economy on the economy in following three points (through which the informal economy is holding back economic growth): first, companies that operate covertly, cannot benefit from various institutions (e.g. courts, banks) and consequently may invest too little and, secondly, because the companies operate covertly, they have this additional cost – fear of discovery and punishment. "The funds that are hidden do not find the use of the highest value." (Johnson et al., 1999, p. 1), and thirdly, the already mentioned loss of tax revenue for the state results in delay of provision of public goods. As Johnson et al. (2001) note, that companies operate in the informal economy, and Kyle (2001) says that the shadow economy reduces the efficiency of the economy, as companies focus on avoiding the administrative burdens rather than increasing productivity.

As we have mentioned previously, informal economy has not only negative but also positive consequences that are often not negligible. Hence, the source of the existence of the informal economy can be confusing.

Informal economy primarily means a positive result for consumers, because they can purchase a product or service at a lower price (excluding tax). Further, you can also get the goods or services faster in the shadow economy in comparison to the production of too much saturated official sector. This is a simple example of the early time of transition, when the gray economy has developed in response to the insufficient supply of the official sector.

It also has a positive impact on the individuals, if the person in the official economy cannot find employment, but may be employed in the informal economy. This brings source of income and, consequently, represents solution for the problem of survival.

Impact on the (small) entrepreneurs is definitely a positive to a certain extent, becausee bureaucracy for small businesses represents much effort and improper use of funds. Therefore, (at least temporarily) many small businesses opt for undercover operations. When a company develops, they decide to enter the formal economy. From this perspective, therefore, the underground economy is considered an incubator for business ideas. Even Frey and Schneider (2000, p. 8) point out that the positive effects of the informal economy (or, more widely, the informal sector) to find a particular "dynamic and entrepreneurial spirit, which can lead to increased competition and higher efficiency". Therefore, it can establish entrepreneurship, appropriate institutions and the potential for higher economic growth. Therefore, the informal economy has positive effect on the whole economy and not only positive consequences for the individual. If the informal economy represents a new additional activity, it may have a beneficial impact on the rest, i.e. the official economy, through consumption in the informal economy money in the official economy (Rosser et al., 2000, p. 163). Schneider (Frey and Schneider (2000, p. 9)) give an example, namely, that two-thirds of the (hidden) income in the shadow economy is directly consumed in the official economy, which creates an incentive for this. Similar findings also provide Rosser et al. (2000, p. 162) when they say that "the informal economy can be useful for economy, as it provides a basis for business dynamics, competition and efficiency versus incorrect state regulation." Therefore, the informal economy helps to develop markets and financial instruments and business and further develop the legal, social and economic institutions necessary for accumulation.

Along with the causes and effects of the informal economy, it does not represent the whole aspect of this phenomenon in the economy. There is an important intermediate, namely actors in the informal economy: producers and consumers. By examining demographic and socioeconomic characteristics of those who work in the informal economy or spend, we come to the closer understanding of the occurrence and development of the informal economy, which is a step closer to minimizing the negative consequences of the phenomenon in the economy and society. In this way, we can understand the positive effects of the underground economy at the national level, and try to move the positive sides of the informal economy in legal action.

Manufacture in the informal economy can be more competitive versus companies in official economy, as manufacturing, which employs on "black market", does not contain a significant part of the costs: such as social and health insurance, as well as all other (unpaid) taxes. On the other hand, there is a so-called unfair competition from companies that "play" by the rules.[14]

14 Nastav B., Merjenje,vzroki in posledice siva ekonomija v Slovenija, Doktorska disertacija, Univerzitet v Ljubljana,Ekonomska Fakulteta, Ljubljana,2009, p. 112.

SHADOW ECONOMY IN MACEDONIA

The problem of the shadow economy is very strongly and deeply embedded in the Macedonian society. First, it reflects negatively on public revenue and is the main instigator and creator of tax evasion, which directly damage the overall economy. Generally, the shadow economy has negative impact on the state employment rate, causing distortions in the national statistics, undermines legal competitiveness, and slows economic growth.

Reduction of the gray economy in particular will contribute to the overall economic development and job creation. It is particularly represented in agriculture, services and industry. Therefore, the Government starts with developing and implementing a coherent program for dealing with gray economy trying to transfer shadow economy in the formal, as a first step in solving this problem. Changes in the tax system, social security system and other types of incentives and support will affect increasing of the interest of unregistered companies register. Benefits to starting a business and support businesses, will be associated with a registered office. This will increase percentage of the legal transfer (formal) of shadow economy.

Compliance and improvement of legislation in accordance with European principles will contribute to this, and on the other hand, will create appropriate penalties for makers of illegal business. Strengthening surveillance and punitive measures for those who are working in the informal economy, i.e. strengthening supervision, strengthening personnel inspection facilities and integrated inspection work (cooperation and coordination of the State Labour Inspectorate with other inspection services), will significantly contribute to reducing the underground economy.

Informal economy is widespread, causing an increase in some of the indicators of the labor market (i.e. unemployment). According to the latest report of the ETF for the Republic of Macedonia (2007), informal economy in the country is 33%-37% of GDP, and in 2010, over 40% of GDP. The problem with the strong growth of the gray economy is due to the fact that persons, who are actually employed, are recorded as unemployed.

From the review of regulations issued in connection with the prevention and sanctioning of the gray economy, it can be concluded that such regulations are not lacking, but rather the efficiency in their implementation, i.e. the inability to fully prevent the informal economy as a phenomenon, with given number of people who engage in it.

Legislation containing provisions to prevent or punish the informal economy, are mainly the following:

- Trade Law (Official Gazette No. 16/04, 128/06)
- Labour Law (Official Gazette of RM No. 62/05).
- Law on Copyright and Related Rights (Official Gazette of RM No. 23/05 - Consolidation)
- Law on Customs Measures for Protection of Intellectual Property Rights (Official Gazette of RM No. 38/05)
- Customs Law (Official Gazette of RM No. 39/05)
- Company Law (Official. Gazette Nos. 28/04, 84/05, 25/07)
- Law on Registration of Cash Payments (Fig. Gazette Nos. 31/01, 42/03, 40/04, 70/06, 126/06)
- Law on Prevention of Money Laundering and Proceeds of Crime (Fig. Gazette No. 46/04)
- Law on Payment Operations (Fig. Gazette No. 113/07)
- Law on Personal Income Tax (Fig. Gazette No. 74/06 - consolidated text).
- Corporate Income Tax Law (Official Gazette No. 27/06 - consolidated text)
- Law on the State Market Inspectorate (Fig. Gazette Nos. 35/97, 23/99, 7/02, 20/02)
- Law on Financial Police (Fig. Gazette No. 55/07)
- Law on Police (Official Gazette of RM, No. 114/06)
- Law violations (Fig. Gazette Nos. 62/06, 69/06)
- Law on Courts (Official. Gazette Nos. 58/06, 62/06)
- Law on Excise Duties (Official Gazette No. 34/10)
- VAT Law (Official Gazette 155/2012)
- Other regulations that contain provisions, particularly for offenses, which sanctioned the gray economy.[15]

15 www.akademik.com.mk/ accessed on 22/12/2012.

Table 2 Estimation of SE using the total electricity consumption method

Estimation of SE using the total electricity consumption method													
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
GDP	in milion MKD	236.389	233.841	243.970	258.369	272.461	295.052	320.058	364.989	411.728	410.734	424.762
EC	GWh	5.207	5.018	4.973	5.698	5.764	6.227	6.440	6.747	6.897	6.392	6.782
SE%	% of GDP	34,10%	33,23%	31,49%	34,22%	32,75%	32,67%	31,02%	28,14%	25,16%	23,38%	24,01%
St	SE	80.609	77.701	76.833	88.423	89.241	96.399	99.275	102.719	103.609	96.049	101.986
TA	estimated total activity (GDP+SE)	316.998	311.542	320.803	346.792	361.702	391.451	419.333	467.708	515.337	506.783	526.748

Source: Shadow economy in R. Macedonia, Vesna Garvanlieva, MBA Vlatko Andonov, Marjan Nikolov, MSc, Center for Economic Analyses (CEA), October, 2012, Open Society Institute Think Tank Fund Budapest

In almost all transition countries, the informal sector is a source of income, without which much of the population could not survive. In terms of the situation in the Macedonia, several sources provide information of informal activities. In one survey (Schneider F., 200413)[16] of gray economy in ten transition countries (Bulgaria, Croatia, Czech Republic, Hungary, Macedonia, Poland, Romania, Slovakia, Slovenia) including Macedonia, Macedonia had the largest shadow economy in 2003 with 41.2% of GDP, followed by Bulgaria with 35.9% and Romania with 34.9%. According to the criteria, however, the OECD shadow economy in Republic of Macedonia in 2007 was around 20% of GDP and according to latest official data of the State Statistical Office, the gray economy in the country was approximately 30% of gross domestic product (GDP). However, unofficial estimates suggest that the gray economy accounts for only 35-40% of the country's GDP, and the darkest forecasts up to 50% of GDP.

The basic justification of the Electricity Consumption Method (ECM) for measuring the size of the shadow economy, is that the electricity consumption in a country is proportional to total economic activity of the country and the changes in electricity consumption which do not correspond to changes in the total activity of the country, signifies a proportional change in the size of the shadow economy within the total economic activity.

The electricity consumption is regarded as the single best physical indicator of overall (both official and unofficial) economic activity moving in sync with GDP with elasticity close to one. This means, that the growth of total electricity consumption is an indicator for growth of overall (official and unofficial) GDP.

16 Шнајдер Ф., 2004, Големината и развојот на работната сила во сивата економија на 22 транзициски и 21 ОЕЦД земји : Што навистина знаеме?, p.7.

The table above presents the inputs used for calculation of the SE in Macedonia for the period between the years 2000 and 2010. As mentioned, the SE estimate through the electricity consumption method relies on an already calculated value of SE in a base year which in our case is year 2000 with a SE estimated at 34,10% of GDP. Although the relative share of the shadow economy within the total economic activity are strongly dependent on the shadow economy in the base year and can be misleading, regardless of the initial base value estimate, the dynamic trend of SE in GDP is not affected.

The general trend for the observed period shows that the SE in Macedonia as a percentage of the GDP is declining, from 34,10% in 2000 to 24,01% in 2010. Starting from 2000 until 2010 the SE is declining slowly, by one to two pp per annum in the first half and then in the second half of the period decreases with higher rate to almost three pp per annum. The 2003 SE estimates is an exception when it is increasing from 31,49% in 2002 to 34,22% in 2003. During the year (2002-2003) the annual growth rate of the EC was 14,9% which is much greater than the annual growth rate of the GDP for the same period (5,9%). According to the Kaufmann/Kaliberda method, this is an indicator of the total economic activity (including the industry and the households) which means that are using more electricity to produce goods and services that are not captured by the recorded official GDP.[17]

Macedonia is a country with a very high unemployment rate, which can be related to the jobless economic growth. The unemployment rate in 2000 and 2010 was 32%. Meanwhile, the unemployment rate was growing and declining. Comparing 2000 and 2001, the unemployment rate declined by 1% points which can be attributed to those people who were engaged by the GoM due to the crises in 2001 after which were dismissed, thus making pressure to the unemployment rate in the upcoming years.[18]

In Macedonia, work in the informal sector is often seasonal work, temporary employment, or part time jobs where workers often have low skills and low pay, informal workers, usually dealing with traffic retail markets, but there are other forms of employment in illegal labour market (most common in construction, transport, textiles, household services, etc.), and has the appearance of new non-traditional forms of gray economy (offering hardware and software services, etc.). In this sense, the Ministry of Economy of the Republic of Macedonia undertakes activities and measures to legalize the shadow economy with an action plan to reduce gray economy.

CONCLUSION

The shadow economy includes those economic activities and the income derived thereof that circumvent or avoid government regulation or taxation. Main reasons are system of government and tax burden, but also the increasingly difficult economic situation that is simply forcing people to look for additional sources of income. At the same time, the very generous welfare system in Macedonia facilitates the use of this system and enhances the work in the informal economy.

Dissimulative conditions related to taxation, high contributions, social security and too regulated economic system, are often cited as the main reasons for informal work. However, in some countries as Macedonia, low wages, irregular or non-payment of wages and logs, heavy dependence on the state, i.e. the large number of welfare or unemployment compensation, are additional reasons for the increase in the informal sector. The gray unemployment in Macedonia is significantly high, as a result of the low level of job creation, which results in slow economic growth and lack of investments, regional differences, social problems, high unemployment rate among the young population, very high long-term unemployment and unemployment among vulnerable groups, gender inequality and mismatch between the education system and needs of the labour market etc.

Reduction in the unemployment rate, which is among the most serious economic and social problems, requires frequent changes in Macedonian economy, dynamic economic growth, appropriate social policies, more appropriate distribution of income and resources, and education re-

17 Shadow economy in R. Macedonia, Vesna Garvanlieva, MBA Vlatko Andonov, Marjan Nikolov, MSc, Center for Economic Analyses (CEA), April 2012, Open Society Institute Think Tank Fund Budapest.
18 Report on the labour market in Macedonia, CEA, 2005.

forms. Complex objectives related to reducing unemployment and the informal economy, would be difficult to achieve, if there are no changes in the relevant regulation.

The Government has a range of measures, such as reducing taxes and tax procedures, reducing the contributions that employers provide employees, simplifying of business regulation, but slow functioning justice system and the need for better control and regular payment of VAT in local shops, retail markets, contracts for rental property, all craft services, remain a problem. Another problem is the so-called professional "black" and seasonal workers who work but do not declare income, and still use the other benefits such as health and social security because legally they are unemployed.

By removing unfair competition, formalizing informal economy, providing opportunities for persons dealing with informal or gray economy, working in the formal economy and opportunities for registering activities with certain minimum taxes or lump-sum payment, strengthening entrepreneurship, strengthening surveillance and punitive measures for those who work in the gray and black economy, strengthening supervision, strengthening staff capacities inspection and integrated inspection work (cooperation and coordination of the labor inspectorate, market inspection, Public revenue office tax audits etc.), it will significantly contribute to reducing the informal economy.

According to estimates, about 70 thousand people work and are registered as unemployed. The Government need to find other measures that will help to a great extent to reduce the rate of gray economy to affect the GDP and to include all activities that are implemented in the country's gross domestic product in order to reflect the real situation.

REFERENCES

[1]. Report on the labor market in Macedonia, CEA, 2005.

[2]. Шнајдер Ф., 2004, Големината и развојот на работната сила во сивата економија на 22 транзициски и 21 ОЕЦД земји : Што навистина знаеме?, p. 7.

[3]. Nastav B., Merjenje,vzroki in posledice siva ekonomija v Slovenija, Doktorska disertacija, Univerzitet v Ljubljana,Ekonomska Fakulteta, Ljubljana,2009, p. 112.

[4]. Doboz & Pohl, 1995, p. 18.

[5]. Klara Sabirianova Peter, Income tax flattening: Does it help to reduce the shadow economy?, Georgia State University.

[6]. Shadow economy in R. Macedonia, Vesna Garvanlieva, MBA Vlatko Andonov, Marjan Nikolov, MSc, Center for Economic Analyses (CEA), October, 2012, Open Society Institute Think Tank Fund Budapest ref. 6 ftp://ftp.econ.au.dk/afn/wp/03/wp03_07.pdf, p. 11.

[7]. Friedrich Schneider and Dominic Este, "Shadow Economies Around the World- Size, Causes, and Consequences", Max-Planck-Institute for Research into Economic Systems, 1999.

[8]. The currency demand approach has been used by Cagan (1958) and further developed by Vito Tanzi (1980¬1983).

[9]. Kaufman and Kaliberda, The Underground Economy in Poland, 1996.

[10]. Friedrich Schneider, The Shadow Economy in Germany: A Blessing or a Curse for the Official.

[11]. Schneider (2011), The Shadow Economy in Europe 2011.

[12]. http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/documents/OECD_nonobserved_economy_2002.pdf.

[13]. http://www.businessjournalz.org/articlepdf/BMR_1205.pdf.

[14]. IZA Bonn , (kpeter@gsu.edu) January 17, 2008, p. 6.

[15]. Economy?, Economic Analysis & Policy, Vol. 38. No. 1, March 2008, p. 90.

[16]. www.akademik.com.mk/, accessed on 22/12/2012.

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THE ROLE OF THE OMBUDSMAN IN THE CONTROL AND OVERSIGHT OF THE SECURITY SYSTEM IN THE REPUBLIC OF MACEDONIA

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Abstract: The control and supervision of all institutions and main aspects of the security system is a bulwark of democracy in modern living. In cases of injury and violation of citizens' rights and freedoms by the institutions of the security system, especially by the police, among other forms of control, undoubtedly there is the ombudsman. It is a particularly important institution in modern democratic society, in charge of protecting the rights and freedoms of citizens by the state authorities.

The main subject of the paper is the ombudsman, as a relatively new institution in the legal system of the Republic of Macedonia, which was established with the Constitution of the Republic of Macedonia and the Law on the Ombudsman which is established for jurisdiction for the protection of the constitutional and legal rights of citizens when violated by bodies of state administration and by other bodies and organizations with public mandates. The matters that fall within the Ombudsman's competence are made on the basis and within the framework of the Constitution and the law, and international legal acts on human rights and freedoms.

In this paper reports of the Ombudsman's work in the last three years in the Republic of Macedonia will be analyzed, in order to determine the quantity and quality of complaints filed by citizens for violations of their rights by any of the institutions of the security system. In this way the work of the Ombudsman in relation to his treatment, the measures taken and the results arising from such activity will be analyzed.

Key words: Ombudsman, control, surveillance, security system, the Republic of Macedonia

INTRODUCTION

The security system in each state is composed of institutions and bodies responsible for establishing and maintaining safety, security, stability and balance in society. Entities in the security system are given numerous and varied powers for keeping security in the country. To prevent the abuse of entrusted legal powers, duties, and obligations it is necessary to establish an effective system of measures and activities appropriate to control and supervise of the security system in the country. Such control and supervision must be in accordance with the principles of democracy, i.e. it must be transparent and accountable.

The security system is a totality of all state and non-state institutions acting according to the safety norms right to have rights, duties and responsibilities in the area of security. The security system is an entity consisting of more interrelated parts that function harmoniously which is one of the main security features. These parts are: 1 / Safety law (legal norms) that regulate security relations and the conditions of society and the state, 2 / Institutions and bodies for security functions (public sector bodies, authorities of private sector, human and non-governmental organizations from civil sector); 3 / Measures to resolve security issues (preventive and repressive).[1]

Control should be seen as a positive activity that, even at the stage of execution of the tasks, enables the discovering of weaknesses and errors, so that they are corrected and prevented from their recurrence.[2] The term control means the activities of identifying, measuring, monitoring, checking of the realized qualitative and quantitative results, i.e. the realization of the goals of all organizational elements.[3]

1 Spaseski, J., Nikolovski, M., Gerasimoski, S., Security systems (contribution to the teaching for the national security systems), Faculty of Security, Skopje, 2010, p.18,19,23
2 Bakreski, O., Controls in the security section, Faculty of Philosophy, Skopje, 2008, p.41
3 Stankovic T., Planning, Faculty of Civil Defence, Belgrade, 2004, p. 303

Supervision usually is equated with control, but it is a possible nuance of meaning to happen. So it is not wrong to say that compared to control, oversight puts focus on consistency or continuity. Nevertheless, monitoring and control mean subordination of their employees. Supervision may be considered a broad and enduring process. In this sense, control is an integral part of the supervision. Accordingly, the surveillance without control is possible and feasible, but it is not efficient enough.[4] The supervision is a collection of information, data and reports that are directly related to performance of the duties and tasks by security agents.

Control and supervision of the security system is a bulwark of democracy. They are carried out in all institutions of the security system, without exception and should not be subject to political influences and pressures. Democratic control and supervision are complete when performed in all main aspects of the security system. Mechanisms of control and surveillance indicate proper role and functioning of the security system in a free and open society.[5]

Democratic control and supervision are realized through the use of a series of specific instruments designed to ensure political accountability and transparency of the security system. These instruments include: constitutional principles, legal rules and institutional and logistical provisions, as well as the most common activities aimed at encouraging good relations between different parts of the security system on the one hand and political powers (executive, legislative and judicial) and representatives of the civil society (NGOs, media, political parties, etc.) on the other.[6]

In a democratic environment the police must be based on public consent, trust and cooperation, if they are to be effective and efficient. Informing the community that the police actions are legitimate gives the police powers to proceed with such actions. Public consent depends on the accessibility of the police and services they offer to the community. The police in their operations need to be neutral and not subject to political influences.[7]

Today it is particularly important to emphasize the need for transparency, accountability and responsibility of the police work. Internal control and monitoring of professional standards should be the smallest part of the control chain, and mostly it should be a judicial control. But given the strong politicization of society and the police, and political impacts on the entire system, there is a strong need for further development of civilian control. [8]

As an important mechanism of control and protector of the rights of citizens when violated by the institutions of the security system, especially by the police, among other types of control, undoubtedly there is the institute of the ombudsman.

OMBUDSMAN OF THE REPUBLIC OF MACEDONIA

The Ombudsman is a person (body), usually (but not always) appointed by the government or parliament and authorized to represent the interests of citizens by acting upon complaints filed by individual entities. The word is derived from the Old Norwegian ***umboðsmaðr*** and the word ***umbuds man,*** meaning representative, not specifying the sex. It was first used in Sweden. The contemporary use of the term began in Sweden within the Swedish Parliamentary Ombudsman, established in 1809 to protect the rights of citizens by establishing a supervisory agency independent of the executive. [9]

The Ombudsman, known to the world under the name of Ombudsman, as a new institution in the legal system of the Republic of Macedonia was established by the Constitution of the Republic of Macedonia (Official Gazette of RM no. 52/91, no. 1/92, no. 31/98 and br.91/01). The Law on the Ombudsman (Official Gazette of RM no. 60/03) states its jurisdiction to protect the constitutional and legal rights of citizens when violated by bodies of the state administration and by other bodies and organizations with public mandates.

4 Tomiko, Z., The normative assumption of civilian control of the military and police, stated in Bakreski, O., Control of the security sector, Faculty of Philosophy, Skopje, 2008, p.
5 Flury, P., Hadzic, M., Sourcebook on security sector reform, DCAF, Geneva/Belgrade, 2004, p. 289
6 7th point, Recommendation 1713 (2005), Democratic oversight of the security sector in member states, Parliamentary assembly, Council of Europe
7 Flückiger, S., Armed Forces Civil Society and Democratic Control, International peace bureau, Geneva, 2008, p. 36
8 Taseva, S., Democratic oversight at the national level and international, year at the Police Academy, Skopje, 2007, p. 417
9 taken from the free electronic encyclopedia Wikipedia: http://www.mk.wikipedia.org [accessed 01/10/2013]

For 10 years now the Ombudsman in Macedonia has been serving to protect the rights of citizens when violated by bodies of the state administration and by other bodies and organizations with public mandates. Among others, special attention is given to the protection of the rights of citizens when violated by the police.[10]

The Ombudsman[11] is an independent, professional and vocational institution and it executes the functions and responsibilities, in particular, the principles of objectivity, impartiality, responsibility, honesty, diligence, accuracy, urgency, expediency, the right not to be a member of a party, equality in rights protection and freedoms of citizens regardless of gender, color, race, religion and the like.

The matters within its competence, the Ombudsman makes on the basis and in the framework of the Constitution and the law, and international legal acts on human rights and freedoms.

When the Ombudsman concludes that the legal rights of the petitioner are violated within the constitutional and that other irregularities occurred, it may: make recommendations, opinions and suggestions on how to eliminate the violations; propose again to conduct certain proceedings under or according to the law; initiate disciplinary proceedings against an official or responsible person and submit a request to the competent public prosecutor to initiate proceedings for the purpose of determining criminal responsibility.

The Ombudsman is elected and dismissed by the Assembly of the Republic. The Ombudsman is elected for a term of eight years with the right to be re-elected. In carrying out the functions and powers, the Ombudsman is assisted by the deputies elected by the Assembly of the Republic of Macedonia.[12]

The election and dismissal of the Ombudsman and his deputies by the Parliament of the Republic of Macedonia is made by a majority vote of the total number of MPs within which there must be a majority vote of the total number of MPs belonging to non-majority communities in the Republic of Macedonia.[13]

Citizens may file a complaint in the following forms:

- written (in person or by mail);
- oral report on the premises of the Ombudsman;
- by telephone or fax;
- by e-mail.

The Ombudsman may initiate proceedings before the competent authorities and organizations if the following have been fulfilled:

- A petition must be signed containing the personal data of the applicant (name, address, phone, etc.);
- It must contain the circumstances, the facts and evidence on which the complaint is based (resolution, decision, appeal, conclusion, certificate, opinion, etc.);
- The complaint should be referred to the authority or organization or official to which the petition refers to the act (decision, conclusion, certificate, etc.) which violated his right
- To be clarified whether and what remedies invested the applicant.

The petition should be understandable and clear.

The Ombudsman will always respect the privacy and confidentiality of the data of the complainant in dealing with the petition and the applicant by doing so must not and should not suffer adverse consequences from the body that has violated the law. For the submission there is no submission fee.

10 Akjimovska-Maletik, I., Ombudsman of the Republic of Macedonia- protector of the rights and freedoms of citizens, Skopje, 2010, p. 69

11 Ombudsman has 10 deputies, four in Skopje and six regional offices Ombudsman of the Republic of Macedonia has several organizational units: 1. Organizational unit for expert-analytical works

2. Organizational Unit for International Cooperation and Public Relations

3. Organizational unit for human resources and financial management

4.Organizational unit to coordinate the work of the ombudsman

The Ombudsman has Regional Offices in Tetovo, Kumanovo, Kicevo, Bitola, Stip and Strumica.

The Ombudsman facts are taken from the official website of the Ombudsman: http://www.ombudsman.mk [accessed 01/05/2013], the Ombudsman Law and the Constitution of the Republic of Macedonia.

12 Act 77, The Constitution of the Republic of Macedonia

13 Amendment XI, Constitution of the Republic of Macedonia

Filing of the complaint does not require strictly prescribed form and the petition may be in handwriting. An informal form for filing a complaint may be found in the office of the Ombudsman.

The assistance and intervention made on behalf of the Ombudsman may be required by any citizen of the Republic of Macedonia and the stranger (personally or through his representative) when it is said or concluded that some of its constitutional and legal rights have been violated by acts or actions of administrative bodies and other bodies and organizations with public authority.

The protection of the rights may be required from the Ombudsman after the citizen has addressed (filed application, asked for help, intervention or other action) the competent authority or organization, and that authority or organization has failed to take an appropriate action.

Proceedings before the Ombudsman shall be initiated by filing a complaint (complaint, appeal), which may be submitted in person at the Office of the Ombudsman, by mail, an oral report to the Ombudsman, by fax or by email.

The Ombudsman may initiate proceedings on its own initiative, but the continuation of the procedure requires the agreement of the citizen who has violated the constitutional or legal right.

Ombudsman intervenes in the following cases:

- individual rights of citizens are injured by acts or actions of the state bodies and other bodies and organizations with public mandates;
- Upon requests of citizens are administrative acts (decisions, conclusions, certificates, certificates, opinions, etc.) that wrongly determined facts, wrongly applied the substantive law violated administrative or other proceedings;
- Acted arbitrarily, bureaucratic, indecent and inhumane towards citizens;
- Not acted on requests or adopted a positive decision on the request without legal basis;
- Delayed procedure upon request;
- Not include the interested party in the proceedings;
- Client is referred from one to another counter or from one other body work and collecting evidence that the body can both work to obtain;
- Not implemented executive and final administrative acts, and act upon the instructions of the second instance administrative and judicial authorities.

Injuries [14] of the constitutional and legal rights may be in various areas carried out in various ways and forms: intentional and unintentional, bureaucratic, arbitrary, inappropriate and inhumane behavior, acting upon the request of the citizen, not implementing an act, decision, conclusion, issuing certified their response and so on, prolonging procedure, unequal treatment of citizens, mistakenly passed an act, an act based on faulty and incomplete factual situation, an act based on the wrong material law, violated procedure and all other intentional and unintentional behaviors and acts that violate the rights and freedoms of the citizens guaranteed by the the Constitution, laws and international agreements and conventions.

In police procedures, the Ombudsman responds to violations in the procedures for the acquisition and termination of citizenship of the Republic of Macedonia, abuse of official powers of the police and the deprivation of the right of defense in keeping police procedures, the procedures for temporary injuries, items seized injuries procedures for issuing identity documents, travel documents, acting upon charges filed by citizens, injury and delay the procedure for registration of motor vehicles, violations of the rights of prisoners and detainees in penal and correctional institutions and other institutions in which freedom of movement is restricted, and others. In the area of justice, it acts in violation of the rights of citizens with unjustified delay proceedings not reaching court judgments or their untimely submission of the parties, untimely submission lodged regular remedies competence not answer request for data from the Trade Registry, default executive orders, abuse of power by the judicial police, unjustified delay administrative litigation (issuing various certificates, work with clients in court records, archives, etc.), delay proceedings or

14 Injuries for which citizens can seek protection of their rights in the following areas: pension and disability insurance, health care, labor, urban planning and construction, property issues, police procedure, discrimination, public services and consumer rights, finance, justice and social rights, residential area, education, local government, environmental protection, child protection, customs operations, defense, national and minority rights, Science, sports and Culture and other rights.

acting upon submitted applications from citizens for the purpose of taking prosecuting and bringing charges, violation of the rights of persons who are in institutions in which freedom of movement is limited (prisons, correctional centers) and so on.

In the defense, it reacts in violation of military conscripts in recruitment and other rights exercised military duty, violation of the procedure for service in reserve, violation of the procedure for exemption from the obligation to participate in military exercise etc.

The Ombudsman is competent to act before: the Government (departments, committees, and secretariats), the ministries (bodies within the ministries and regional offices).

When the Ombudsman concludes that the rights of the applicant are violated by the authorities referred to in Article 2 of the Law, the Ombudsman may:

• make recommendations, suggestions, opinions and suggestions on how to remove the violations (reference given when the security is established that it is a violation of a specific act or action, and gives opinion when it is deemed necessary to amend an enactment of the authority or organization. Indications point at the case when the actual situation arises that the continuance of certain behavior of the body or organization violate the rights of the complainant);

• to propose a re-implementation of certain proceedings in accordance with law, if the legal conditions are met for repetition or renewal of the procedure at the request of a party or if there are grounds for changing the administrative act ex officio;

• to initiate disciplinary proceedings against an official or responsible person, if it considers that its action or failure to act has grounds for suspicion that he has infringed work or duty;

• submit an application to the competent public prosecutor for determining criminal responsibility if it is determined that there is reasonable suspicion of misdemeanor or criminal offense prescribed by law;

• request a temporary delay in the execution of the administrative act to the decision of the appellate authority or the decision of a competent court, if the violation of rights, and the execution of the administrative act would cause irreparable damage to any of the parties in dispute.

The Ombudsman, whenever possible, during the procedure takes amicably attitude towards resolving the matter. The agreed resolution of the case proceedings in the matter shall be considered completed. The settlement must be made in accordance with the Constitution and laws.

During the procedure, the Ombudsman may be called the principle of equity when the objective and subjective circumstances and existing positive law arises that the application of legal provisions might lead to obvious injustice.

After receiving the complaint, the Ombudsman may decide not to initiate proceedings or not to take into consideration the petition if it is anonymous, it is not submitted within the prescribed period or if an abuse of the right to appeal has occurred, but shall, as soon as possible inform the applicant to explain the reason for it and possibly teach him how to exercise the right.

The Ombudsman shall dismiss the complaint if:

• the data available show that it is not a violation of fundamental rights and freedoms of men and citizens;

• the complaint is not complete if the applicant upon prior recommendation of the Ombudsman does not complain

• the subject of the complaint is an ongoing litigation.

The Ombudsman is not to institute proceedings if the action or final decision of the authority or organization was made a year before the complaint was submitted, unless it finds that the initiator missed the deadline for good reasons. If the Ombudsman decides to initiate a proceeding it shall notify the complainant and the authority or organization to which the petition refers.

Within its jurisdiction, upon the receipt of the complaint procedure, the Ombudsman may:

• seek explanations and additional information from the bodies or organizations for the allegations in the complaint;

• have a direct insight into the competences of the bodies or organizations;

• invite for a talk an official or officer of the authority or organization and any other person, and to seek the opinion of scientific institutions.

Bodies and organizations are obliged to cooperate with the Ombudsman and on his request provide all data and information regardless of the degree of confidentiality and enable the implementation of the procedure. The confidentiality regulations oblige the Ombudsman.

When the Ombudsman finds that the constitutional or legal right of the petitioner has been violated, he may:

- propose the body or organization to conduct a procedure in accordance with the law;
- submit an application to the competent authority to initiate administrative proceedings;
- submit an application to the authority or organization for the temporary suspension of the execution of the act;
- propose initiation of disciplinary proceedings against the official body or organization;
- submit an application to the competent public prosecutor to initiate proceedings in order to establish the offense or criminal liability;
- make proposals to improve the operation and conduct of the authorities or organizations with the parties.

Bodies and organizations are obliged to act on the proposals, opinions and recommendations of the Ombudsman within a period not longer than 30 days to report on the measures and actions taken by its requirements. If the bodies and organizations fail to act and fail to inform the Ombudsman about the implementation of its suggestions and recommendations, or only partially accept them, the Ombudsman can inform the immediate superior authority, the relevant ministry, the Government of the Republic of Macedonia, and write a special report to inform the Assembly of the Republic or publicly announce the subject. Once the Ombudsman completes the procedure, it shall inform the complainant.

ANALYSIS OF ANNUAL REPORTS OF THE OMBUDSMAN

Professionalism, professional approach and above all legitimacy in the performance of work by employees of the Ministry of the Interior, in its scope and police officers in the police are an essential prerequisite for the successful realization of the function of this crucial organ of the executive, but also an important guarantee for ensuring a smooth and full exercise of fundamental human rights and freedoms of citizens.

Police actions, as opposed to the guaranteed constitutional and legal rights of citizens, are one of the most important spheres of actions under the mandate of the Ombudsman. This is a particularly sensitive area in which there is a very thin line of distinction between the rights of citizens, on the one hand, and the legal obligations of the police, who are obliged to maintain public peace and order and to ensure their safety and security, on the other hand.

Thus, we should not disregard the fact that the police are the only state body that has the legal right and authority provided for by law to use physical force and coercion that may be a threat to a citizen's physical integrity, even life.

The Ombudsman is one of the key independent control mechanisms that monitors and controls the execution of police powers, and its lawful authority to obtain the opinion of a professional institution, allows measures and actions before the competent national authorities to initiate proceedings for the purpose of determining criminal responsibility and in the case of the internal control mechanism of the Ministry of the Interior - Sector for Internal Control and Professional Standards assessed that certain police powers were reasonable, justified and within the legal powers.

The monitoring and supervision of the conduct of the police officers in the performance of their duties as the members of the Ministry of the Interior, the police function as an integral part of the Ombudsman and as the protector of basic human rights and freedoms always represent an area of particular importance. Indeed, it is the result of the fact that due to the nature of the work performed by the police officers who have been given powers which, if exceeded, lead to a severe violation of fundamental rights and freedoms of citizens. Unfortunately, almost every year there are incidents involving police officers.

Hereinafter the paper presents the content analysis of annual reports of the Ombudsman of the Republic of Macedonia for the period from 2007-2011[15] in terms of the received complaints

15 Content analysis was made on the following reports: Ombudsman, Annual Report 2007, Skopje, 2008; Ombudsman, Annual Report 2008, Skopje, 2009; Ombudsman, Annual Report 2009, Skopje, 2010; Ombudsman, Annual Report 2010,

about police actions. First there is the review of the policing percentage share of complaints received treatment in the total number of complaints, and then their percentage ratio in respect sub-areas. Separately there is the analysis of the statements and opinions of the Ombudsman in relation to the principle of presumption of innocence and its violation by the Ministry of the Interior - Police.

Table 1 Percentage share about received complaints about police treatment in the total number of complaints to the Ombudsman in 2007-2011

	2007	***2008***	***2009***	***2010***	***2011***
Received complaints about police treatment	**193**	**236**	**252**	**238**	**179**
%	**6.37**	**7.81**	**6.94**	**5.89**	**4.21**

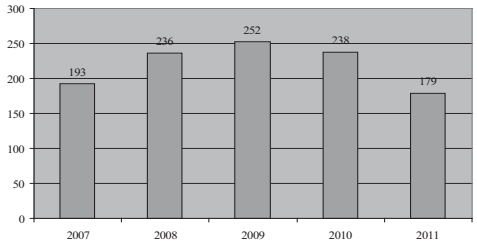

Chart 1 Received complaints about police actions to the Ombudsman in the period 2007-2011

Table 1 shows the percentage share of complaints received about the police treatment in the total number of complaints to the Ombudsman from 2007-2011. According to the percentage share, complaints about police actions occupy the largest percentage of total complaints filed in 2008, and the lowest percentage in 2011. After 2008 there was a decline in the percentage share of complaints about police actions in the total number of complaints, leading to the conclusion that the citizens have lost their confidence in the Ombudsman and therefore do not complain or have a fear of further implications by the police if lodging complaints against their members. In the second variant, there are no errors or misconduct in the police actions which is not possible, because a large number of NGOs, along with the Ombudsman indicate the number of such abuses and the increasing of their number. Numerically, as shown in Chart 1, the situation is different - the largest number of complaints were received in 2009, even 252, and at least in 2011, a total of 179.

Table 2 Percentage ratio of the received complaints about police actions to the Ombudsman under sub-areas for the period 2007-2011

	2007	***2008***	***2009***	***2010***	***2011***
Not taking measures for protection of the lives and property of the citizens	8.3	22.88	19.44	28.57	34.08
Unbiased or unlawful inducement from freedom	-	-	1.19	10.08	2.79
Violence or over use of	27.5	17.80	24.21	13.03	11.17
Delay	2.1	9.75	6.35	11.76	9.50
Keeping in the police station longer than 24 hours	3.6	8.90	0.40	0.42	-
Other	58.5	40.68	48.41	36.13	42.56

Skopje, 2011; Ombudsman, Annual Report 2011, Skopje, 2012

In Table 2 the terms of the received complaints about police actions to the Ombudsman under sub-areas in the period 2007-2011 are presented in percentage. From the displayed statistics, it can be seen that over the years most of the complaints are about the measures undertaken in order to protect the life and property of the citizens as well as of violence or excessive use of force by police officers in the course of the police actions. However, it is characteristic that from the Office of the Ombudsman all other causes with fewer percentage are placed in another category and their percentage share is about half of the complaints about police actions. All the above reasons which are certainly not less important than the previous ones are placed here.

Hereinafter referred to as the labor will be made and presented content analysis of annual reports of the Ombudsman (Ombudsman) of the Republic of Macedonia for the period from 2007-2011 in terms of respect for the principle of presumption of innocence[16], as a particularly important principle in the criminal procedure. The reports will include the remarks, comments, suggestions, recommendations and proposals of the Ombudsman concerning infringement and violations of constitutional and legal principle of presumption of innocence in criminal proceedings by the organs of criminal prosecution.

It is characteristic that the Ombudsman's annual reports for 2005 and 2006 did not take into consideration any comments, recommendations or suggestions in relation to the principle of presumption of innocence. The Ombudsman's annual report for 2007 states that in 2007, there were cases of the violation of constitutional and legal principle of the presumption of innocence guaranteed by the European Convention for the fundamental human rights and freedoms, with smooth realization of the rights of citizens. The Ombudsman's opinion was that it was necessary to strictly adhere to that principle.

In the Ombudsman's annual report for 2008 there were re-registered cases of violation of the principle of presumption of innocence that was indicated in the previous report, where the Ombudsman recommended that in the future it is necessary to refrain from actions contrary to the principle of presumption of innocence.

In the Ombudsman's annual report for 2009, there was no evidence of any comments, recommendations or suggestions in relation to the principle of presumption of innocence.

In the Ombudsman's annual report for 2010, which refers to the constitutional principle of presumption of innocence tendencies for its injury by publicly exposing suspects and exaggerated publicity, especially when it came to public officials and others who had been exposed in public and social life were noted. Public exposure, which consequently produces labeling suspects with far-reaching consequences not only for them but for their families, according to the Ombudsman, is a phenomenon that unless they violate an individual, it undermines the entire democratic atmosphere in society and creates the citizens' mistrust in the justice system and the system of values in general. This mistrust is caused by the cases directly affecting the citizens' perception that the suspects are guilty without being proven guilty by a court decision. The overall assessment is that in 2010 the principle of presumption of innocence was violated by many subjects and in different ways.

The Ombudsman's annual report for 2011 stated that we had witnessed the spectacular arrest of the leader of the political party which was carried out in a way that directly violated the principle of presumption of innocence, acting for several years now that the Ombudsman points out that it is illegal. There is no doubt that the discovery of the perpetrators of criminal offenses, their arrest, providing evidence and conducting a Judge of the basic functions of the police. However, the police actions taken in the act of the deprivation of liberty, especially their transparency highlighted media presentation, unnecessary and leave no room for doubt that there was tendentiousness in cases of this kind. Therefore, once again the Ombudsman indicates in this report that during the arrest and other actions, the police officers should have maximum respect for the people's physical and psychological integrity, and to allow the court to determine their liability when there is a suspicion of committing a crime.

16 Presumption of innocence in the Republic of Macedonia is the rise and the level of constitutional principle in Art. 13 of the Constitution of the Republic of M acedonia. According to act 2 of the Code of Criminal Procedure. Pursuant to Article 13 paragraph 1 of the Constitution of the Republic of Macedonia, a person accused of an offense shall be presumed innocent until his guilt is established by a final court decision. And according to the general provision of Article 2, paragraph 1 of the Criminal Procedure Code (CPC), a person charged with a criminal offense shall be presumed innocent until his guilt is established by a final court judgment.

In recent years, in the Republic of Macedonia there has been a worrisome tendency towards spectacular arrests and making statements by senior officials of the Ministry of the Interior of the Republic that the Police have indisputable evidence. The media, particularly journalists and editors of media programs and policies, with their stories, reports and articles often publish the data, information and images of people who had criminal charges against them, who had been placed under arrest or heard before an investigating judge or trial that is still ongoing in the Macedonian courts. It is a flagrant violation of the presumption of innocence. The passive role of investigating magistrates who can react in these cases was observed and if the manner of arrest or apprehension of interrogation may affect the principle of presumption of innocence. These and similar comments and remarks on several occasions were published in the reports by the Ombudsman and the Helsinki Committee, but also by other NGOs dealing with human rights and freedoms. Therefore, the question that has lately been asked more frequently in our society is: "Are the bodies for the prosecution, i.e. institutions within the security system in the Republic of Macedonia, the principle of presumption of innocence determined by the Constitution of the Republic of Macedonia, the Criminal Code and the Criminal Procedure Code, as well as international documents (declarations, conventions, protocols) that our country has ratified and thus they are part of our legal system?" The answer to this question is that the principle of the presumption of innocence in criminal proceedings in the Republic of Macedonia is not observed correctly, completely and in all its progress. Nevertheless, numerous violations and violations by the police, investigative and judicial authorities, but by the media, which is often the public reaction by domestic and foreign NGOs, political parties, civil society, human rights experts and so on have been noted. Violations were noted during the police investigation, investigation and litigation, and by the police, the judiciary, and the media, as their supporters of the atmosphere, and due to their larger audience.

CONCLUSIONS AND RECOMMENDATIONS

The Ombudsman is a relatively new institution in the legal system of the Republic of Macedonia, which was established by the Constitution of the Republic of Macedonia and the Law on the Ombudsman, which determines its responsibility to protect the constitutional and legal rights of citizens when violated by bodies of the state administration and by other bodies and organizations with the public mandates. The Ombudsman acts on the basis and in the framework of the Constitution and the law, and international legal acts on human rights and freedoms.

One of its features is the implementation of the control and supervision over the institutions of the security system in the Republic of Macedonia and their legal action. Thus, the Ombudsman exerts control over police actions, so that citizens can complain if they think that any of their rights and freedoms is limited, injured or abused. The Ombudsman acts and undertakes measures in accordance with its competence. Some of the conclusions and recommendations of the Ombudsman relating to the security system, its institutions and functions for the analyzed period are as follows:

- Weaknesses in admission procedure for police officers and their poor quality education in the course of employment cause the violations of human rights and freedoms of citizens. Detecting flaws and disadvantages of continuous training and taking measures for their removal force police officers to pursue vocational and professional respect for human rights and freedoms.
- During police actions, especially in the process of arresting, there are still cases of violation of the principle of presumption of innocence. Until a final court judgment does not establish liability for an offense, all stakeholders in society must refrain from comments and opinions on the guilt and responsibility.
- The work of the Sector for Internal Control and Professional Standards noted weaknesses in the procedures of the police officers who violated human rights by exceeding police powers. To continue the cooperation with the Ombudsman, the Internal Control must intensify the research on specific cases of violation of human rights, and bring decisions carefully, objectively, impartially and in accordance with the principles of legality and justice so that every guilty action is punished in accordance with the seriousness of the offense and accountability.
- Despite the actions taken to improve the conditions in police stations where suspects are apprehended, there are still places of detention below the generally accepted standards. Therefore,

Macedonia should continue the activities of creating higher standards in all police stations of general competence.

• The Ministry of the Interior must inform applicants whether their complaints are within its jurisdiction and advise them on their legal rights if there is no legal basis for the police to take action in a certain case.

BIBLIOGRAPHY

[1]. Akjimovska-Maletikj, Ombudsman of the Republic (Ombudsman) protector of the rights and freedoms of citizens, Skopje, 2010
[2]. Bakreski O., Control of the security sector, Faculty of Philosophy, Skopje, 2008
[3]. Ombudsman Annual Report 2007, Skopje, 2008
[4]. Ombudsman Annual Report 2008, Skopje, 2009
[5]. Ombudsman Annual Report 2009, Skopje, 2010
[6]. Ombudsman Annual Report 2010, Skopje, 2011
[7]. Ombudsman Annual Report 2011, Skopje, 2012
[8]. Ombudsman's official website: http://www.ombudsman.mk [accessed 01/05/2013]
[9]. Free electronic encyclopedia Wikipedia: http://www.mk.wikipedia.org [accessed 01/10/2013]
[10]. Spaseski. Nikolovski, M. Gerasimovski S. Safety systems (contribution to the study of national security systems), Faculty of Security, Skopje, 2010
[11]. Stankovikj T., Planning, Faculty of Civil Defence, Belgrade, 2004
[12]. Taseva S. Democratic Oversight of the national and international level, Annual Police Academy, Skopje, 2007
[13]. Constitution of the Republic of Macedonia
[14]. Flury, P., Hadzic, M., Sourcebook on security sector reform, DCAF, Geneva / Belgrade, 2004
[15]. 7th point, Recommendation 1713 (2005), Democratic oversight of the security sector in member states, Parliamentary assembly, Council of Europe
[16]. Flückiger, S., Armed Forces Civil Society and Democratic Control, International peace bureau, Geneva, 2008

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THE PLACE AND ROLE OF PUBLIC SECURITY IN SECURITY STUDIES AND CONCEPTS

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Abstract: Identifying the essence and nature of security is a hard, complex and multidimensional problem and challenge. There is consensus that security means absence of threats to basic values, but there is disagreement as to whether the main focus of research should be on individual, national or international security. During the Cold War, the idea of national security was dominant and it was mainly defined with military notions. At the end of the 20th and the beginning of the 21st century, under the influence of the changes in international relations (globalization and regionalisation, demographic and ecological problems) the research of security has been extended towards the concepts of individual, national and global security.

The area of the social relations regulated (by adopting regulations) and provided (by enforcing the regulations) by the state includes the area of public security. This area is part of the broader area in which it is interwoven, it is the area of security, which in addition to public security, also includes state and military security and, of course, the private security sector (private security) should not been neglected although in our country it is in the stage of early development and positioning itself in the overall security system. Public and state security, along with several other areas in the scope of public administration regulated by law, is also part of another broad area, which is the area of internal affairs.

Keywords: security, national security, international security, individual security, societal security and global security.

INTRODUCTION

The contemporary discussions on security, one of the focal concepts pertaining to the survival and development of the individual, the society, the nation and the state, are still overburdened with the problem of identifying its contents. The identification of the essence and nature of security is a complex and multidimensional problem and challenge. Most theoreticians agree that security is a contested concept. Namely, there is a consensus that it means liberty from threats to the basic values, however the major disagreement is whether the main focus of the research should be the individual, national or international security. In the Cold War period, the national security idea was prevailing and was mainly defined with military terms. In the last decade of the 20th century, the concept of security shifted from the realistic understanding of security in terms of the military strength/power of the state towards new concepts: individual, social and global security. The importance of security was expanded by including economic, social and ecologic aspects, in addition to the military and political aspects.

Security arises from the needs of the individual. It is an interest of preserving the personal and collective goods and warning of possible violations of the accepted social values. According to contemporary understanding, security may be individual, national or global, economical and ecological. There are certain disagreements in the academic circles as to whether security can be legitimized as science. While some scientists believe that it is a completely independent discipline, with a defined subject, goals and methods of study, others classify it in areas bordering various social sciences, since with its requirements, security is "sea without a coast"[1]. Hence, it may be read that the political sciences, law, sociology, criminology and military skills have security in their basis and consider it as their derivative. When we speak about national and global security, it must be clear that it acquired its contemporary concept and form after the toppling of the Berlin Wall, that is, after the Cold War. The terrorist attacks of 11 September 2001 marked a new era in security studies and

1 *Студије безбедности: потреба или мода*, www.odbrana.mod.gov.rs/o0dbrana030/28-32.pdf [accessed on 12/04/2010].

practice. Globalization and the processes that have led to changes in the structure of world power and strength also conditioned the emergence of occurrences that are perceived as challenges, risks and threats. Ranking these notions and occurrences depends on the level of their impact on security and are therefore latent, potential or immediate jeopardizing factors.

The scientific and expert debates polemicize security and the science of security. Thus, instead of a science, it is called a condition (integral security), an area (security sector) or a designated system. Security is beyond any doubt all this together. It is an important human activity that encompasses numerous processes, subjects and relations. This sphere is characterized by specific events and occurrences that pose a challenge for many individuals, bodies and organizations, and primarily for the country.

Concerning the above stated, one can note two traditional concepts of security:[2]

a) the concept of national security – the one of the state-cantered character where the central place is occupied by traditional vital state values which are taken care of by the state through its security system, and

b) the concept of international security – the one of the international character where the values of the international community and security of the international regions are promoted and which are taken care of by the states through their international relations, cooperation or through certain international organizations. The traditional concepts of international security are: balance of power, collective security and world government[3].

Therefore, it can be concluded that, in traditional terms, security was observed in the spirit of the orthodox concept of the national security, as well as the traditional concept of the international security, which was based on the principles of state-cantered security[4], and that the basic assumption of the traditional concept of security was that the state was secure only when it would achieve a balance between military threats and its own military capabilities to react to them.[5]

MODERN CONCEPTS OF SECURITY

At the end of the last century, Barry Buzan expressed the view that the traditional concept of security through studying force (realist school, security is the goal) and peace (liberal, idealistic school, security is a consequence) is not the most appropriate for the understanding that notion, and that such an approach does not provide a clear definition of security. Specifically, B. Buzan said that security should be considered in more comprehensive manner, that is, more openly, and that a clear difference should be made between concept of security and concept of national security[6].

Specifically, the end of the Cold War and the collapse of bipolarity affected the manner in which the concept of security was observed, and especially meaningful discussions were led about the nature and the meaning of security. One group of authors insisted on expanding the concept of security through the inclusion of new, broader potential security threats, primarily economic development, environmental degradation, human rights violations and large migratory movements. Another group of authors, starting from the broader dimensions of security, insists on expanding the agenda of security studies by including into researches a number of security segments such as individual or human security, national security or security of the society, as well as regional, international and global aspects of security issue. On the other hand, the third group of authors stuck to the traditional state-cantered approach to security issue inserting into it new forms of security (common security, collective security, cooperative security, etc.) thus creating new theoretical models of multilateral interstate security relations, which could lead to clarification of the security issue in interstate relations.[7]

2 Mijalkovic, Sasa, Nacionalna bezbednost, *op. cit*., p. 61.
3 See more: Bajagic, Mladen, *Osnovi bezbednosti*, Belgrade, 2007, pp. 39–51.
4 Mijalkovic, Sasa, Keserovic, Dragomir, *Osnovi bezbjednosti*, Banja Luka, 2010, p. 62.
5 Simic, Dragan, Nauka o bezbednosti – savremeni pristupi bezbednosti, *op. cit*., p. 24.
6 Buzan, Barry, People, States and Fear: An Agenda for International Security Studies in the Post-Cold World Era, New York-London, 1991, p. 24.
7 Tatalovic, Sinisa, Novo razumijevanje sigurnosti i sigurnosno okruzenje na jugoistoku Europe, *op. cit*., p. 47.

Furthermore, the end of the 20th century was marked by global changes that have contributed to the activation of the process of transferring traditional powers entitled only to the state to the private sector. Nowadays, it has been increasingly spoken and written about the privatization of security as a phenomenon that is widespread and accepted more than it has been in any previous period in the history of the modern national state.[8] Today we are witnessing the fact that various companies, individuals, international organizations, NGOs and even the government itself use the services and trust the private sector and let it take care of their security.[9]

Therefore, after nearly four hundred years, the state and its institutions are not the only entities that take care of the internal and external security of its citizens[10]. Westphalian system of nation-states, as the undisputed pillar of the international order, has been replaced by a much more complex reality that put back to the scene the privatization of the war and conflict[11], and a sector, a private one, operating on a commercial basis, appeared in a security system. The theory states that this new model of providing military and security services enables governments and public institutions to increase their efficiency by concentrating on the most important tasks, while responsibility for less important tasks is transferred to the private security sector.[12] Therefore, today, apart from the state, there are many other subjects that are significant for the security, such as individuals, social and private groups, non-governmental organizations, international organizations, etc., and they all can act on the national, but also on the international scene.[13]

The changes after the Cold War[14] were those that largely motivated scholars of security studies to significantly broaden the concept of security from the traditional, state-cantered one towards a new, global or transnational focus. Security is now seen and understood as a complex issue that is necessarily related to the influence of man to the changes in the global environment, as well as to the influence of global change to man's behaviour[15].

As it was said by D. Simic, "it is the act of introducing of the individual, as an independent entity of global relations, that represents a "tectonic line", a *differentia specifica* of the new global security order in *statu nascendi* against all present and previous organizational principles and forms of national and international security"[16].

Therefore, the broadening of the security research field certainly implies broadening of the content of the security notion in all directions beyond the particular nation-state, i.e.: upwards – towards international institutions, downwards – towards regional or local governments and sideward (left and right) – towards non-governmental organizations, public opinion and the media, and the abstract forces of nature or the marketplace[17].

When defining security in contemporary conceptual sense, the main disputes stem from a question on the values that should be protected nowadays (physical and material security, political independence, territorial integrity, international peace, and similar), as well as from the effort to define the basic entity that is the subject of protection (citizen – the individual, state, international community, social security, economic system, the environment, etc.).[18]

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8 Small, Michelle, Privatisation of Security and Military Functions and the Demise of the Modern Nation-State in Africa, Accord, Occasional Paper Series: Volume 1, Number 2, 2006, p. 4.

9 Pavlovic, Gojko, Pravo privatne bezbjednosti – comparatory study, *op. cit.,* p. 6.

10 Petrovic, Predrag, „Privatizacija bezbednosti u Srbiji", *Bezbednost Zapadnog Balkana*, No 4, 2007, p. 13 (pp. 13–21).

11 Schreier, Fred, Caparini, Marina, Privatising Security: Law, Practice And Governance Of Private Military And Security Companies, op. *cit.,* p. 1.

12 Richards, Anna, Smith, Henry, Addressing the role of private security companies within security sector reform programmes, Saferworld, London, 2007, pp. 3–5.

13 Mijalkovic, Sasa, Nacionalna, *op. cit*., p. 79.

14 Primarily, here is referred to the disintegration of the political environment and the process of globalization and interdependence which is expanding rapidly.

15 See more: Rothschild, Emma, *What is Security*?, Daedalus, Vol. 124, No. 3, 1995, pp. 53–107; Grizold, Anton, *Medjunarodna sigurnost: Teorijsko-institucionalni okvir*, Zagreb, 1992.

16 Simic, Dragan, Nauka o bezbednosti – savremeni pristupi bezbednosti, *op. cit*, p. 17.

17 Basic, Nedzad, Stoett, Piter, *Sigurnosne studije u tranziciji*, Bihac, 2003, p. 152. Compare to: Pavlovic, Gojko, *Pravo privatne bezbjednosti – uporedna studija*, Banja Luka, 2011, p. 17 (footnote 48); Tatalovic, Sinisa, „Koncepti sigurnosti na pocetku 21. stoljeca", *op. cit.,* p. 64; Bajagic, Mladen, *Osnovi bezbednosti*, Belgrade, 2007, p. 54.

18 Dragisic, Zoran, „*Sistem nacionalne bezbednosti – pokusaj definisanja pojma*", Vojno delo, No 3, 2009, p. 163 (pp. 162–176).

Essentially, all these questions can be brought down to a couple of the following:[19]

a) security for whom? – first of all, it is necessary to identify the centre of security construction, and the role of so-called "referent object" or "referent subject" of protection can be given to the individual, social groups, the state and the international system[20];

b) security for which values? – it is necessary to identify the values and interests that are the subject of protection or the object of jeopardy[21];

c) security from whom/ what threats? – it involves the identification of the sources, subjects and forms of compromising protected values which may be natural, human or technological in their nature[22];

d) who provides security? – it is necessary to identify the entities that protect the mentioned values[23], and

e) the manner of providing security? – it is necessary to identify the methods, means and activities that will be deployed to protect specific, vulnerable values[24].

Based on the above mentioned, various concepts or notions of security are being created, according to which the security in the contemporary conceptual sense is defined as[25]:

a) the security of man – the individual, people and society[26];

b) the security of the state, or national security[27];

c) international security[28] – modern concepts: security of the community, security regime, security complex and cooperation in security[29];

d) the global security[30].

Therefore, the breakdown of the bipolar security structure has caused significant changes of "Cold War" security factors. The circle of non-state subjects that have an impact on the security has significantly expanded at the expense of reducing the role of the state. At the same time, there has been a change in the security sources and threats. In addition, the number of objects occupying the security focus has been significantly expanded, as well as the manner, means and instruments for achieving security. The subjects of security concerns, in addition to national security, are now the security of individuals, common security, as well as international and global security[31].

NATIONAL SECURITY

In the "International Encyclopedia of the Social Sciences", Benkowitz and Beket define national security as "the ability of the state (nation) to protect its internal values from external dangers".[32] Aćimovċ Lj. highlights the widely accepted definition of national security "as the absence of a threat to the basic values of a given country".[33] He stresses that the threat to the protected values is not just a direct physical assault, such as an armed aggression to the territorial integrity and independence of a country, but also every kind of threat to its core national values by direct or indirect use of force or a threat.

19 Mijalkovic, Sasa, „*Nacionalna bezbednost – od vestfalskog koncepta do posthladnoratovskog*", Vojno delo, No 2, 2009, pp. 56–57. Compare to: Simic, Dragan, Nauka o bezbednosti – savremeni pristupi bezbednosti, *op. cit.,* p. 22.

20 Baldwin, David, The Concept of Security, *op. cit.,* p. 13.

21 *Ibid*., p. 13–14.

22 On the sources, carriers and forms of jeopardy see more in: Vejnovic, Dusko, Sikman, Mile, *Defendologija*, Banja Luka, 2007.

23 On subjects of security see more in: Rakic, Mile, Vejnovic, Dusko, *Sistem bezbjednosti i drustveno okruzenje,* Banja Luka, 2006.

24 Baldwin, David, The Concept of Security, *op. cit.,* p. 16.

25 Mitrovic, Ljubinko, Pavlovic, Gojko, Sistem bezbjednosti Bosne i Hercegovine – pravni aspekti i aktuelno stanje, Banja Luka, 2012, p. 20.

26 See more in: Bajagic, Mladen, *Osnovi bezbednosti*, Belgrade, 2007.

27 See more in: Mijalkovic, Sasa, *Nacionalna bezbednost*, Belgrade, 2009.

28 See more in: Pendarovski, Stevo, *Mećunarodna bezbednost*, Skopje, 2009.

29 See more in: Simic, Dragan, „Savremene teorije bezbednosti", U: Jankovic, P. (Ur.): *Antologija tekstova sa Skola reforme sektora bezbednosti,* Belgrade, 2007, pp. 165–193.

30 See more in: Gacinovic, Radoslav, „Klasifikacija bezbednosti", *Nauka, Bezbednost, Policija*, No 2, 2007, pp. 3–23.

31 Vejnovic, Dusko, Obrenovic, Predrag, Defendoloski (zastitni, bezbjednosni i odbrambeni) izazovi u medjunarodnim odnosima sa pogledom na Bosnu i Hercegovinu, Banja Luka, 2012, p. 66.

32 International Encyclopedia of the Social Sciences, vol. XI, 1968, p. 40.

33 Aćimovċ Lj. (1978), *Problemi bezbednosti i saradnje u Evropi*, IMPP i Prosveta, Beograd, p. 71.

According to R. Petković, national security is the security of an individual state, the security of its national sovereignty and territorial integrity.[34] Dimitrijevć V. and R. Stojanović believe that there is no generally accepted definition of national security, and state that it would have to contain two elements: a value and a cognitive element. Hence, it should be known which values are in question and what is the threat to them[35]. A. Grizold defines national security as the security of the national territory (including the airspace and territorial waters), the protection of human life and property, maintenance of national sovereignty and the exercise of the fundamental functions of the state.[36]

Many definitions of national security highlight the absence of any fear of attack, threat to the interests or a threat by another or other countries, and security is positioned affirmatively towards uncertainty and fear and represents a state of complete tranquillity in which the state is not threatened in any way. It is certain that this situation is of a solely subjective nature and it is very difficult to establish objective criteria that can determined this condition. The subjective sense of national security is tied to the foreign policy makers and their assessment of the level of security or insecurity of their country. At a time of major changes in international relations when military technology rapidly changes the coordinates of possible conflicts, we can only speak of relative security. Thus, each member state of the international community must accept certain concerns as possible, aware that absolute security is impossible.

However, the security towards which every state strives means a physical survival of a country and its population, independence and material prosperity of the country and if these elements are not endangered, national security is at a normal level. National security is understood as a systematic security problem in which individuals, states and the international system have their own share, and in which the economic, social and environmental factors are equally important as the political and military factors.[37]

PUBLIC SAFETY

Security is a basic requirement of society as a whole, and to all of us separately, regardless of any difference. Security is not all in our lives, because in order to achieve the required quality of life, a wide spectrum of different content is required, but it can be said with certainty that without security, everything becomes nothing. That is why the discipline of public safety deals with security issues, i.e. public safety, which we can define in various manners, but here the main approach will be security as a field of social relations which is regulated with laws, and which is being implemented with the realization of those laws.

One of the fields of social relations that the state arranges (with the adoption of provisions) and provides (with the carrying out of provisions) is the field of public safety. This field is part of one wider field, with which it is interlocked, and that is the field of security as a whole, where in addition to public safety, it is composed of state and military security, and one should not neglect the private security sector, which only recently began to be developed here and is taking its place in the overall security system. At the same time, public and state security, together with some other public administration tasks stipulated by law, belongs in one also wider field, and that is the field of interior affairs.[38]

All these fields separately encompass certain groups of questions that are stipulated by law and bylaw provisions. Thus, the field of interior affairs covers security and other issues, and it speaks about a wider spectrum of issues that are stipulated within law in this field and are arranged within that field. The field of public safety also encompasses security and other issues of significance for achieving public safety, which are distributed and stipulated with the laws from that field etc.

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34 Petković R. (1981), *Sistemi bezbednosti u evropskom prostoru*, Institut za političke nauke, Zagreb.
35 See more in: V. Dimitrijevć i R. Stojanović (1979), *Međunarodni odnosi*, Beograd, Nolit, pp. 248-254.
36 Grizold A. (1992), Raspotja nacionalne varnosti; Obramboslovne raziskave v Sloveniji, Fakultet za druzbene vede, Ljubljana.
37 See: Георгиева Л. (1999),*Творење на мирот*, Студио ада, Скопје, Европа 92, Кочани.
38 Милетић С., Талијан М., Јавна безбедност, Нови Сад, 2011, p. 9.

What is different are the basis by which some issues may be distributed and arranged within public safety, and the two most frequent norms are organic and functional.[39] From the organic point of view, all issues from the responsibility and scope of the police responsible for public safety are issues that are divided into the field of public safety, while, according to the functional norm, all issues that are in the function of public safety are divided into the field of public safety, regardless whether the police is responsible for public safety or some other organ. Observing from the functional aspect is considered more correct, but in legislation and practice there is a presence of entwining of these two norms. The reason for this is that not so often only relative borders are present between the separate fields of social relation. As we said, achieving public safety in the required level is in the sphere of the interests of all people, which inevitably influences the fact that the circle of issues in the field of public safety is very wide, and of course very diverse. Seeing in the abstract, among them we can differentiate issues that are related with public safety itself and issues that are related with the police for public safety, i.e. their organization, work, supervision and control. Public safety police, which as a term is already in wide use, out of rational reasons, we will denote it only as – police in the further text.

It is not easy to determine the content of the term security, above all because it has several meanings in theory, legislation and in everyday practice. The term security is one of the most frequently used terms in modern conditions with some other terms such as globalization, transition, terrorism and etc. So, if from the total security milieu we only take out public safety and we consider it as a condition that enables effective protection of the people from danger, it is necessary to take into account that that condition is maintained and (eventually) advanced with the carrying out of the work of the public safety police for protection of security of the people. Not just the condition but also the security situation may be different having in mind the degree of protection of people from danger, i.e. endangerment of their safety. Even any security relevant event causes a smaller or bigger change in the security situation, where the fact that there is no, nor is there a possibility to achieve absolute security should be taken into account.

Even though approaches are different, we have accepted the view according to which two appearing forms should be differentiated in public safety. The first is that in the field of public safety, public (basic) interest is manifested, which is being justified by achieving (maintaining, improving) security of all people, and it can be added – also to the security of other living beings on planet Earth and its surrounding. The second is that in the field of public safety, personal (individual) security of the person is manifested as his/her protection from dangers, or threat to the life, physical integrity and property, and thus his/her safety in the exercise of basic and other personal rights and freedoms that belong to them. All this confirms the earlier thesis that security is in the sphere of interest of the society as a whole, but also of each individual as well.

In addition, in situations when it comes to danger, which can threaten people, regardless whether it is security of a group or personal security or individual safety, it may vary, and general danger differentiates with individual dangers. General danger represents situations caused by a natural disaster, accident or other incident that endangers the lives and health of people in their surrounding, and the latest example is – such as the recent disaster that hit Japan, where the level of overall risk significantly exceeded the boundaries of Japan. All other dangers are individual, irrespective of what caused them, and which are eradicated by the competent authorities and other stakeholders. When it comes to public safety police, it should be noted that its responsibility to protect people's safety from dangers implies – in accordance with the constitutional principle – that all people must be provided with equal protection. This protection is achieved by achieving public safety, i.e. to preserve and (or) improve it in conditions of relatively favourable or unfavourable situations, based on the constant monitoring and evaluation of the situation.

In order to understand this very significant field of public administration in the required manner, it is necessary, first of all, to learn the terms – the public, public relations, and the term for police and police functions in general.

39 Ibidem, p. 9.

SUBJECT OF THE SCIENTIFIC TEACHING DISCIPLINE PUBLIC SAFETY

Every science, including the academic-scientific discipline has its own subject of study. The subject of the study of science, and of course the scientific teaching discipline, represents the sphere of its interest. The subject of Public Safety, even though it is a new academic-scientific discipline, which is still being elaborated, at least in our region, has its own clearly defined sphere of interest, therefore, its own subject that makes public safety a separate subject in relation to other subjects that are studies at the faculties of security. What makes this subject special and differs it from other subjects is a set of facts, and in particular the following: first, this academic discipline allows the adoption of specialist expert knowledge from police work, but also from other types of administrative internal affairs, and works for systemic support, without their efficient functioning it would not be possible to adequately perform police work. Also, within this subject, it is enabled to acquire the required knowledge for the term in the public, the significance of the representation in the public of certain activities, the manner that communicating with public interest groups is done, etc.

Furthermore, it is a harmonized system of knowledge on public safety police, which provides an opportunity for the students, but also those who already deal with these important issues in the public sector and those who are engaged in private sector, to get familiarized with the work of the public safety groups, with the types of that work and what is of special importance, the way of performing these activities of common interest.

Then, it is a subject which is under development in our region, and has been introduced in the curriculum of several faculties of security and schools of interior affairs and the expectation is that it will develop in the direction of theoretical and practical discipline, as it certainly is, but also in terms of an academic discipline that deals with the issue of the application of police power and the explanation of the term, the role and the importance of public safety.

This subject mostly deals with issues of the conceptual definition of the public, classification of groups and types of matters related to public safety, definition of the notions of police authorizations and with issues pertaining to the use of police authorization. In addition, it provides some information about other activities that are directly related to the performance of police work.

CONCLUSION

When talking about public safety, it is a practical specialized subject, with the inclusion of theoretical aspects which allow the students to acquire basic knowledge about the operation of the public safety police, but also about the role of the public in its work, as well as the skill of communicating with the public (the citizens), which has been accepted in our region as a new philosophy of the police work.

One of the areas of social relations which the state regulates (by adopting rules) and provides (rule enforcement), is the area of public safety. This area is part of a wider area which is interwoven and it is the area of security as a whole, which in addition to public safety also includes state and military security, and the private security sector (private security) should not be neglected as well, which is just beginning to develop and take its place in the overall security system in country.

REFERENCES

1. Bajagic, Mladen, Osnovi bezbednosti, Belgrade, 2007.
2. Baylis J., Smith S. (2005), The Globalization of the World politics. An introduction to international relations, (third edition), Oxford University Press.
3. Buzan B. (1991), People, States and Fear: An Agenda for International security studies in the Post Cold War Era (second edition), Lyne Riener Publishers, Boulder, Colorado.
4. Бачанин Н., Управно право, Крагујевац, 2000.
5. Богдановић, Б., Два века полиције у Србији, Београд, 2002
6. Бошковић М., Јовичић Д., Криминалистика методика, Бања Лука, 2002.

7. Бошковић М., Криминалистичка оператива I, Београд, 2002.
8. Degan B. Đ. (1982), Međunarodno pravo i međunarodna sigurnost, Svjetlost, Sarajevo.
9. Dimitrijević V. i Stojanović R. (1979), Međunarodni odnosi, Beograd, Nolit.
10. Dimitrijević V. , Beleške o pojmu bezbednosti u međunarodnim odnosima, JRMP, 2-3/72, Beograd.
11. Dimitrijević V. (1973), Pojam bezbednosti u međunarodnim odnosima, SUPJ, Beograd.
12. Вејл, Џ. Лоренс, Цивилна одбрана, Београд, 1991.
13. Grizold A. (1991), Demilitarizacija Slovenije in nacionalna varnost, Zbornik, znanstveno in publicisticno središce, Ljubljana.
14. G-Gučetić, (1967), Međunarodna bezbednost JRMP, Beograd.
15. Гаћеша Д., Полиција, организација надлежност руковођење, Бања Лука, 1998.
16. Јовичић Д., Организација и надлежност полиције, Бања Лука, 2008.
17. Јовичић Д., Улога полиције Републике Српске у имплементацији Дејтонског мировног споразума, Бања Лука, 2005.
18. Кешетовић Ж., Односи полиције с јавношћу, Београд, 2000.
19. Ковачевић М., Организација и начин поступања радника милиције у обављању одређених послова службе јавне безбједности, Сремска Каменица, 1990.
20. Кривокапић, В., Превенција криминалитета, Београд, 2002.
21. Крстић О., Примењена криминалистика, Београд, 1997.
22. Крстић О., Криминалистичка превенција и прогностика, Бања Лука, 2005.
23. Кунић, П., Управно право општи и посебни дио, Бања Лука, 2001.
24. Управно право, Правни факултет, ВШУП, Бања Лука, 2006.
25. Кутлија Д., Практикум за управно право посебан дио и прекршајно право, Бања Лука, 2002. Год
26. Mijalkovic, Sasa, „Nacionalna bezbednost – od vestfalskog koncepta do posthladnoratovskog", Vojno delo, No 2, 2009, p. 56–57.
27. Mijalkovic, Sasa, Keserovic, Dragomir, Osnovi bezbjednosti, Banja Luka, 2010.
28. Mijalkovic, Sasa, Nacionalna bezbednost, Belgrade, 2009.
29. Матијевић М., Криминалистика оператива, Бања Лука, 2002.
30. Милетић С., Талијан М., Јавна безбедност, Нови Сад, 2011.
31. Милетић С., Основи јавне безбедности – послови и начин рада, Београд, 2004.
32. Милетић С., „Полицијско право", Београд, 2003. год.
33. Миросављевић, М., Бања Лука колец – Бесједа, Бања Лука, 2008..
34. Милс, С. Р. Елите власти, Београд, 1964.
35. Милосављевић Б., Наука о полицији, Београд, 1997. Митровић Љ., Иветић С., Збирка прописа о прекршајима, Бања Лука, 2007.
36. Модли Д., Корајлић Н., Криминалистички ријечник, Тешањ, 2002.
37. Обреновић Ж., Тркуља С:, Управно право – област унутрашњих послова, Београд, 1988.
38. Пејашиновић П., Капетина Д., Одбрана и заштита, Српско Сарајево, 1997..
39. Папеш Д., Павлек И., Како се проводи криминалистичка контрола, Београд, 1973.
40. Радосављевић Д., Основи јавне управе, Нови Сад, 2008.
41. Симовновић Б., Пена У., Криминалистика, Источно Сарајево, 2010..
42. Симовић Н. М., Кривично процесно право, Бања Лука, 2007.
43. Симовић Н. М., Практични коментар Закона о кривичном поступку, Бања Лука, 2005..
44. M. Cutlip, A. H. Center, G. M. Broom, Односи с јавношћу, Загреб, 2003.
45. Талијан М., Аранђеловић Д., Велимировић Д., Организација и надлежност униформисаних припадника полиције, Београд, 2001.
46. Талијан. М., Руковођење унутрашњим пословима, друго измењено и допуњено издање, Виша школа унутрашњих послова, Београд, 2001.
47. Weaver O., Buzan B., Kelstrup M and Lemaitre P. (1993), Identity, Migration and the New Security Agenda in Europe, London: Pinter.

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NORMATIVE AND INSTITUTIONAL PRECONDITIONS FOR ACHIEVING SECURITY IN SCHOOLS (RESEARCH ON SECURITY IN SECONDARY SCHOOLS IN THE CITY OF SKOPJE)

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Abstract: Children should have special treatment in society and state institutions should show increased interest in their complete development, taking into account the vulnerability of this age category. The schools as a social primary group - an institution that has functions to educate and bring up young generations, is the first institution in which the child begins to work, learn to take responsibility, get used to the discipline, exercise communication and interaction with peers and teachers in a given cultural-sociological matrix where his success or failure in terms of tasks which are set to him have been evaluated.

The aim of this paper is to analyze the current situation relating to the safety of scholars in secondary schools in the city of Skopje, primarily through an analysis of current legislation, and institutional solutions in this area. For that purpose empirical data will be presented derived from an empirical research "Safety in Schools" conducted in secondary schools in the city of Skopje in 2011 and Yearbooks of the State Statistical Office.

The survey was conducted in all 23 secondary schools on the territory of Skopje based on a random sampling of 549 pupils into the third school year between 10 March 2011 to 24 March 2011 year. The data were processed with statistical processing using a multifactorial analysis, which has not been used in this paper particularly.

The object of scientific observation in this paper is the presentation and analysis of the data from the survey relating to the following questions: 1. Existence of the regulations in the schools, 2. The foreseen measures for disciplining the pupils in compliance with the law and other regulations; 3. The awareness of the existence of the legal procedures in relation to the discipline of pupils and the responsibility for the establishment of that same responsibility.

The paper will also present the analyzed data for a period of 5 - 10 years gathered from the statistical Yearbooks of the Republic of Macedonia and the State Statistical Office, referring to the number of reported and convicted juveniles. These data refer to: 1. Criminal offenses against property of juveniles for the period 2005 -2011; 2. Crimes against life and body of juveniles for the period 2005 -2011; 3. a total number of reported and convicted juveniles for the period 1999 -2011.

Kewwords: **j**uveniles, pupils, security, schools, city of Skopje

INTRODUCTION

Most children spend most of the time out of their homes under the care of adults, as part of the educational process. Therefore, parents as well as adults who work at those places have an obligation to provide a safe environment for children where they can learn and develop. Schools as institutions of public interest, in which educational process of the children has been enforced, should meet the requirements according to international standards and ensure normal conditions for children's right to education. But despite the role of the school to protect the children, unfortunately, many of them are exposed to school violence[1] exactly in the schools, which raises the question of the exercising of their right to education.

1 According to the World Health Organization, violence is intentional use of psychological and physical force or power, impending or actual, against another, or against a group or community, that results or could result in injury, death, psychological underdevelopment or deprivation.

Violence in schools is recognized as a big social problem and because of that the European Commission supports a number of initiatives for solving this problem. One of them is Project CONNECT UK-001, which is one of the six projects related to school violence that was supported by the European Commission between 1998 and 2002. The main goal of this project was to produce a report on the situation regarding school violence in 15 EU countries and two associate countries at the time. In most countries statistics for violence in schools is available, but some of them report about absence of those data.[2] One known initiative of the European Commission is the program DAPHNE, whose numerous projects since 1997 have been focusing on analyzing and working on the topic to put an end to violence in the school environment. In this regard, the Council of Europe adopted the Charter for Democratic Schools without Violence[3] in 2004.

The Republic of Macedonia have conducted several researches dealing with violence in schools, but having in mind the relevance of the issue a comprehensive research that would present the real situation in schools in Macedonia and that would provide guidelines for dealing with violence and security risks in general has not been undertaken yet. Therefore, we have decided to explore the conditions in schools in which scholars in secondary schools in Skopje learn. This survey was carried out in order to identify conditions influencing the development of the deviant phenomena in the behavior of the scholars that include a violent component. The survey tried to identify the security as a multidimensional and complex field by using theoretical and practical experiences with an interdisciplinary approach based on the theoretical understanding primarily of Law and Criminology.

The survey was conducted in 23 secondary schools in the city of Skopje (all secondary schools were surveyed) on a random sampling of 549 pupils from the third year. The pupils born in the period closest to the period of performing the survey i.e. from 10 March 2011 to 24 March 2011 were respondents of the questionnaires.

The basic assumption of this paper is that the Republic of Macedonia provides normative and institutional conditions for the fulfillment of upbringing and educational activities of pupils at schools for working in a secure environment. Several methods are used in the paper, such as: legal/dogmatic method, the method of content analysis and the statistical method. Regarding the survey, the questionnaire is the basic technique that is used for the collection of data. For the purposes of the survey two types of questionnaires were prepared as follows: The first, intended for the school officials (school management, such as a pedagogue, a psychologist, director) in which the general information and records that schools should possess, such as: the number of disciplinary actions, the excluded students, the reported theft, the police interventions after the calls made by the school and the number of absences. The questionnaire also includes a number of questions referring to all physical and technical conditions of construction matters, spatial, or human nature that may affect the security. The second questionnaire was designed for pupils and it involves their attitudes toward their perception of security.

LEGAL AND NORMATIVE ASPECTS OF SECONDARY SCHOOLS IN MACEDONIA

It is undisputable that there is an adequate legislation on the international level prescribing normative and institutional measures that should be undertaken at national levels in order to ensure the required adequate protection of children in general. Consequently, the Convention on the Rights of the Child prescribes that the States Parties should take all appropriate legislative, administrative, social and educational measures in order to protect the child from all forms of physical or mental violence, injury or abuse, neglect or negligent treatment, maltreatment or exploitation, including sexual abuse, while in the care of parent(s), legal guardian(s) or any other person who has the care of the child.[4] The Convention regulates the issue of physical punishment and degrading treatment, there-

2 Peter K. Smith, Goldsmiths College, University of London, United Kingdom, Violence in schools: A European perspective

3 More on: http://www.coe.int/t/f/projets_integres/democratie/02_activit%E9s/15_charte_europ%E9enne_de_l%27%E9cole/04_L1_Macedonian.asp.

4 The Convention on the Rights of the Child, adopted and opened for signature, ratification and accession by the General Assembly resolution 44/25 of 20 November 1989, entered into force on 2 September 1990, in accordance with article 49,

fore, the States Parties are called to take all appropriate measures in order to ensure that the school discipline is administered in a manner consistent with the child's human dignity.[5] Although violence is not specifically emphasized, it is obvious that children cannot fully develop if they are victims of violence. The Committee on the Rights of the Child, established on the basis of the Convention, emphasizes the need for strengthening the links between the school, the family and the community in order to give the children an active role in the prevention and treatment of various forms of violence in a comprehensive manner. Thereby, in terms of acting contrary to physical punishment, the Committee points out that the children do not lose (their) human rights by passing through the doors of the school.[6]

European Court of Human Rights is of the opinion that all forms of physical punishment at school are against the Art. 3 of the European Convention for the Protection of Human Rights and Fundamental Freedoms (amended by Protocol No. 11, entered into force on November 1, 1998). The revised European Social Charter (entered into force in 1999), monitored by the European Committee of Social Rights, provides that children will be protected from physical and moral dangers. The Committee concluded that this article applies to the measures for protection of the children from physical and moral dangers in the family, school and society in general, as well as at work.[7]

Macedonia tries to enforce basic standards set out in international law in its national legislation. According to the Constitution of the Republic of Macedonia[8], everyone has the right on education, which is accessible to everyone under equal conditions. The secondary education is compulsory for all citizens, under the same conditions stipulated by the Law on Secondary Education[9] (hereinafter: LSE). Secondary education in public secondary schools is free of charge. LSE regulates the organization, functioning and management in the secondary education,[10] as part of the system of education. The activities performed in the secondary school are of public interest and they are enforced as a public service.

The school board represents the management authority in the public secondary school and municipal secondary school.[11]. The school board, among other things, decides on appeals submitted by the pupils, parents or guardians of pupils and considers other issues determined by the statute of the state school. The principal is the body that governs the public secondary school and hen/ she is responsible for the legality of the work and the financial operations of the school.[12] According to Article 98 of the LSE the public secondary school forms a Council of Parents, which is composed

section 19, paragraph 1. Paragraph 2 of Article 19 prescribes that such protective measures should, as appropriate, include effective procedures for the establishment of social programmes to provide necessary support for the child and for those who have the care of the child, as well as for other forms of prevention and for identification, reporting, referral, investigation, treatment and follow-up of instances of child maltreatment described heretofore, and, as appropriate, for judicial involvement.

5 Convention on the Rights of the Child, art.28, paragraph 2

6 General Comment No. 8: The right of the child to protection from corporal punishment and other cruel or degrading forms of punishment (Articles 19, 28(2) and 37, inter alia),)CRC/C/GC/8, 2006).; General Comment No. 1: The aims of education, (CRC/GC/1/2001), para.8., acc:European Commission, DG Justice, Freedom and Security, Daphne Booklets: Issues and experiences in combating violence against children, young people and women, Violence and school, Brussels, August, 2008.

7 Bodin, D.,: Violence at school, Background paper for the Europe and Central Asia Regional Consultation for the UN Study on violence against Children, Ljubljana, July 2005, pp 11-12.

8 Constitution of the Republic of Macedonia: Amendments to the Constitution I - XXX, "Official Gazette of the RM", Skopje, 2007, art. 44 and 45. Primary education in Macedonia is compulsory and free. Citizens have the right, under the conditions stipulated by law, to establish private educational institutions at all levels of education, with the exception of primary education.

9 Law on secondary education („Official Gazette of R. M. "no. 44/1995; 24/1996; 34/1996; 35/1997; 82/1999; 29/2002; 40/2003; 42/2003; 67/2004; 55/2005; 113/2005; 35/2006; 30/2007; 49/2007; 81/2008; 92/2008; 33/2010; 116/2010; 156/2010; 18/2011; 42/2011 и 51/2011).

10 According to Art 9 of the LSE, the development of education in public schools is determined by the Program adopted by the Government in accordance with the development documents. The Ministry of Education and Science, "National Program for the Development of Education 2005-2015" with associated program documents: Program for the development of pre-school education; Program for the development of primary education; Program for the development of secondary and post secondary education; Program for the development of higher Education; Program for the development of ICT in education; Program for the professional development of school staff; Program for the development of institutional support of education reforms; Program for providing education and quality control; European language Portfolio.

11 School Board in public secondary school is composed of 12 members: four representatives from the teachers, three representatives from the parents or guardians of pupils, three representatives of the founder and one representative from the Ministry and from the business community.

12 Law on Secondary Education, Art 91 In accordance with Article 93 of the Law, the director of public school may be dismissed, among other things, if with his guilt, any harm to the pupils or their parents or guardians, and the community has been caused.

by representatives of the pupils' parents who must not be employees of the school. The Council of Parents is charged with monitoring and evaluating of the achievements of the educational process.

The supervision over the legality of the work of secondary schools is performed by the Ministry of Education and Science[13] and the professional supervision is performed by the Bureau for the Development of Education in the manner prescribed by the law. An inspection, implemented by the State Education Inspectorate and authorized inspectors of the municipality of the city of Skopje, as regulated by the law, was carried out for the control of the enforcement of laws and other regulations in the field of secondary education in secondary schools.

The Ministry maintains integrated database[14] for the activity of the secondary education, which among other things contains information about: pupils' records, pupils' grades, pupils' absences from classes. According to Article 41 of the LSE, the status of pupils[15] in secondary schools is obtained with the enrollment in secondary school. A status of a full-time pupil[16] can be obtained only in one secondary school. Exceptional pupils are persons that acquire education by self-education, by taking exams for certain plan and program at the secondary school.

The Law on Secondary Education prohibits physical punishment and mental harassment of the pupil.[17] Furthermore, the Law on the Child Protection[18] prohibits all forms of sexual exploitation and sexual abuse of children (child pornography, child prostitution), violent pimping, sale or trafficking of children, psychological or physical violence and harassment, punishment or other inhuman treatment, all kinds of exploitation, commercial exploitation and abuse of children which is the violation of basic human rights and freedoms and the rights of the child.

The Law on Secondary Education prescribes that in the public school a pupil's behavior is evaluated. It is evaluated as: exemplary, good, satisfactory.[19] According to art 57 of the LSE, the following pedagogical measures can be undertaken for the violation of duties and failure to fulfill the same: written warning, warning before removal and removal from the public school. A written warning for the pupil is pronounced by the head of the class, Council of teachers or principal. The warning before removal and disposal is imposed by the Council of teachers. The pupil can submit a complaint against the decision to the governing body of the school within eight days since the receipt of the decision. The governing body of the school can confirm, amend or repeal the imposed pedagogical measure. The decision brought after the complaint shall be final. The removal as a pedagogical measure may be imposed only for a serious violation of duty determined by the statute of the school. This measure can be imposed on the pupil during the entire school year, but only in the course of the school year in which it was introduced.

The Article 58 of the LSE is in line with the opinion of the Committee on the Rights of the Child, which emphasizes the need for strengthening the links between the school, the family and the community. It prescribes the norm for sending the parent or the guardian on counseling if, among other things, the pupil participates in beatings or other forms of violence, the pupil shows asocial or antisocial behavior and the pupil's behavior is immoral or unethical.

The Head of the class can call at least one of the parents or guardians for counseling on the previously mentioned cases inviting them by phone, by mail or by personal delivery. If the parent or guardian cannot answer the invitation for good reason, they are obliged to inform the head of the class, before counseling or within three days after the counseling. The head of the class informs the school psychologist or pedagogue about the delivered invitation for parental counseling.[20] If the par-

13 In cases when the Ministry finds that the statute or other act of the secondary school are not in accordance with the Constitution and the law it will be stopped from the execution until a decision of the Constitutional Court of the Republic of Macedonia is adopted.

14 Law on Secondary Education, art 9

15 Macedonia is lagging behind the countries of the South East Europe in the enrollment of pupils in secondary education. Approximately 85.001% of the pupils who complete primary education are enrolled in secondary education, while rates of dropouts from secondary education during the education is about 16.65%, the dropout rate is around 2.48%, and the stopping of education is 0.88%. See more at: National Action Plan for the Rights of the Child in the Republic of Macedonia 2005-2010 (December 2010).

16 The status of a full-time pupil in a public school ceases if the pupil: finishes his secondary education; does not finish enrollment in terms that are defined by statute; unsubscribe; unjustifiably fails to attend classes continuously 25 school days during the school year; serves a sentence of imprisonment for more than six months repeatedly twice during the school year.

17 The Law on Secondary Education, art 51

18 The Law on Child Protection ("Official Gazette of the RM", no. 170/2010), Art 9, Paragraph 2

19 The Law on Secondary Education, art 50

20 Consultations prescribed in Article 58 of the LSE shall be performed by the school psychologist. If there is not a psychologist employed at school, then counseling shall be performed by the pedagogue. If there is neither a psychologist

ent or guardian fails to appear on the counseling after the third invitation, the Social Work Center shall be informed. A proposal for the initiation of misdemeanor procedures shall be initiated for parents who have not responded to the invitation for counseling and have not justified their absence before the Pedagogical Services.

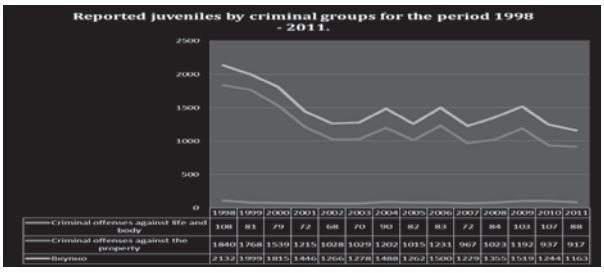
In accordance with the National Plan for Action Regarding the Rights of the Child in the Republic of Macedonia[21], the secondary education in Macedonia is implemented in 91 state (of which 4 schools for pupils with special educational needs) and 3 private schools. In addition, according to the type of secondary education there are 15 high schools, 26 secondary vocational schools, 50 mixed (high schools and vocational) schools. The National Commission for the Rights of the Child in Macedonia has been established with the Government decision in order to monitor the continuity of the implementation of the National Action Plan for the Rights of the Child in the Republic of Macedonia for the period 2005-2015, the Convention on the Rights of the Child of the United Nations and in general to monitor the conditions of children's rights in Macedonia.

One of the institutions in Macedonia that provides special care for children's rights is the Ombudsman of the Republic of Macedonia, and the Deputy Ombudsman who governs the Department for the protection of children's rights, who especially pays attention to and constantly monitors the situation with the protection of children's rights in schools.[22] Continuously monitoring the situation in schools in Macedonia, the Ombudsman noticed that children in primary and secondary schools do not possess the skills and knowledge to recognize the violations of their rights and how to seek protection of these rights, nor have enough courage and knowledge to seek protection outside their school. In addition, it was found that a large number of pupils were not aware of the dangers of alcohol and tobacco abuse and the existence of child trafficking.[23]

SOME ASPECTS OF JUVENILE DELINQUENCY IN MACEDONIA

Here we shall present the data related to the unlawful conduct of the children according to the analysis of the Yearbooks of the State Statistical Office of the Republic of Macedonia. This is important because this record enables following the juvenile delinquency, system of measures (as punishments) which are used enabling limited perception of the problem in one of the many dimensions.

Graphical display - Reported Juveniles by criminal groups for the period 1998 – 2011



nor a pedagogue at school, then the pedagogue or psychologist from another high school shall be chosen for the counseling.

21 National action plan on children's rights in the Republic of Macedonia 2005-2010, December 2005, Skopje, highlights the lack of school facilities and equipment. It is concluded that many school buildings do not meet the technical and hygiene standards, and an even greater number of those lack school supplies, school inventory, basic resources and teaching aids. A significant number of schools do not have gyms, so the physical education classes are performed in classrooms or non-standard rooms. It is necessary to perform technical reconstruction on about 50% of school facilities, and some schools need completely new school buildings.

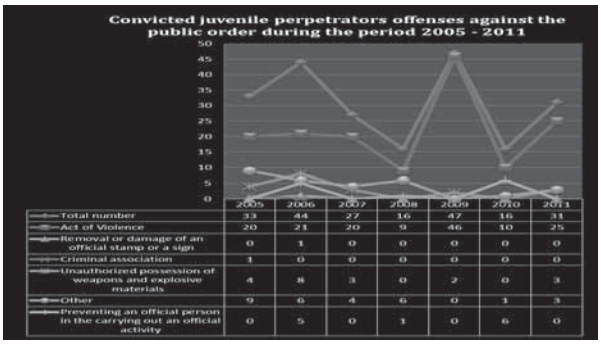
22 Ањимовска Малетић Искра, Заштита права детета преко институције Народног правобраниоца (Омбудсмана) у Републици Македонији, Правни живот, Часопис за правну теорију и праксу, Удружење правника Србије, Том I, бр. 9, Београд, 2005

23 The Ombudsman of the Republic of Macedonia, Information from the visits to primary and secondary schools with the aim of educating children on their rights and obligations, Skopje, 2009. In order to determine the actual situation of physical and psychological violence against children in education, in the course of 2006 and 2007 the Ombudsman surveyed about 5000 pupils from most primary schools in Macedonia, and concluded that there was still a phenomenon of physical and psychological violence against children in schools and that appropriate measures to combat this phenomenon had not been not taken.

The graphical display shows the number of reported children at the age of 14 -18 for: Crimes against life and body; Crimes against property; and Total number of reported children.

The display refers to the period 1998 – 2011. As we can see, we have a positive trend regarding the number of reported children, from 2132 in 1998 to 1163 in 2011. The decrease isr almost 50%, or if we take 1998 as basic index 100, the index in 2011 is 54! But, if we look the data for the crimes against the property we can also see the decreasing tendency, seeing that in 2011 there arer 923 children fewer than in 1998 when there were 1840 children. Having in mind the data given above, we can conclude that the number of total reported children for criminal offences during the period 1998 – 2011 is in constant digression based on the digression of the children for crimes against the property. Regarding the other criminal groups according to the Macedonian Criminal code, we are facing more, or less stable condition related to the number of reported children at the age of 14 – 18.

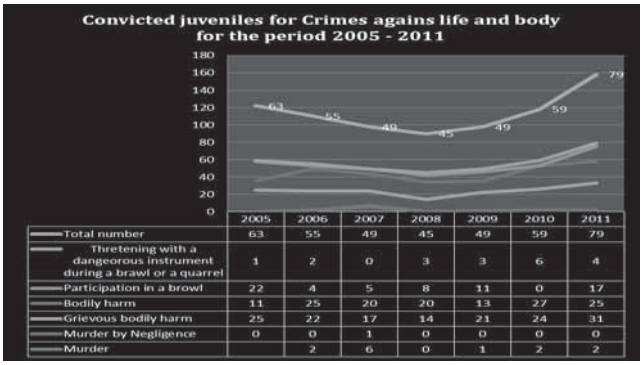
Graphical display 2 CONVICTED Juveniles FOR CRIMES AGAINST THE PUBLIC ORDER DURING THE PERIOD 2005 – 2011



	2005	2006	2007	2008	2009	2010	2011
Total number	33	44	27	16	47	16	31
Act of Violence	20	21	20	9	46	10	25
Removal or damage of an official stamp or a sign	0	1	0	0	0	0	0
Criminal association	1	0	0	0	0	0	0
Unauthorized possession of weapons and explosive materials	4	8	3	0	2	0	3
Other	9	6	4	6	0	1	3
Preventing an official person in the carrying out an official activity	0	5	0	1	0	6	0

The graphical display 2 shows the number of convicted children at the age of 14 -18 for: Crimes against the public order or to be more precise: The Acts on violence; The Unauthorized possession of weapons and explosive materials; The Prevention of an Official person in exercising official duties; Criminal Association; The Removal or damage of an official stamp or a sign; Other crimes and the total number of convicted children at the age of 14 – 18. It is obvious that we have not got any serious deviations in trend related to this type of crime. Rather disturbing is the fact that the act of violence is the most frequent type of crime. Very often offenders come from the sport fun groups organized on the ethnic origin. These acts are usually committed by groups and the level of their danger is not to be underestimated.

Graphical display 3 Convicted Juveniles for crimes against life and body during the period 2005 – 2011



	2005	2006	2007	2008	2009	2010	2011
Total number	63	55	49	45	49	59	79
Thretening with a dangeorous instrument during a brawl or a quarrel	1	2	0	3	3	6	4
Participation in a browl	22	4	5	8	11	0	17
Bodily harm	11	25	20	20	13	27	25
Grievous bodily harm	25	22	17	14	21	24	31
Murder by Negligence	0	0	1	0	0	0	0
Murder		2	6	0	1	2	2

We choose the crimes against the life and body as criminal acts that in general have violent nature. The graphical display shows the number of convicted children at the age of 14 -18 for: the total number of convicted children for Crimes against the life and body at the age of 14 – 18; threatening with a dangerous tool during a brawl or a quarrel; participation in a brawl; bodily harm; grievous bodily harm; murder by negligence and murder. As we can see from the display above, there are no serious deviations related to this type of crime in this group of criminal offences. The bodily harm, the grievous bodily harm and participation in a brawl are the most frequent types of crime and this is quite disturbing. But the Society logged the alarm related to the murders. As we can see, during the period of 2005 – 2011, there are 13 children at the age of 14 – 18 convicted of murder!

Table number 4 Convicted Children by imposed penalties for the period 2007 – 2011

	Children at 14 – 16 years of age.	Total number of Convicted	Juvenile Imprisonment	Rebuke	Disciplinary center	By the parents	In another family	By a Social Agency	Educational Institution	House of Education and correction
	Children at 16 – 18 years of age.	Total number of Convicted	Juvenile Imprisonment	Rebuke	Disciplinary center	By the parents	In another family	By a Social Agency	Educational Institution	House of Education and correction
2007	**14 – 16**	676	-	18	0	122	0	48	1	8
	16 – 18	478	15	46	0	254	0	155	0	9
2008	**14 – 16**	715	-	23	0	118	0	53	0	11
	16 – 18	510	11	95	0	234	0	156	4	10
2009	**14 – 16**	748	-	21	0	116	0	64	1	8
	16 – 18	537	14	64	0	251	0	202	2	4
2010	**14 – 16**	547	-	33	0	80	0	42	2	5
	16 – 18	385	9	74	0	165	0	122	5	10
2011	**14 – 16**	722	-	27	0	116	0	64	2	11
	16 – 18	502	2	65	0	277	0	151	0	7

The table above presents the number and type of penalties pronounced by the Courts. There are two categories of children, children between 14 and 16, and 16 and 18 years of age. Courts can pronounce the juvenile imprisonment as a penalty for the children aging 16-18. As we can see, the number of children who have been convicted does not show significant variation. For example, in 2007 there were 676 children at the age of 14 – 16 and in 2011 there were 722. As we can see, the most frequent penalties for the children are "the enhanced supervision by parent or guardian".

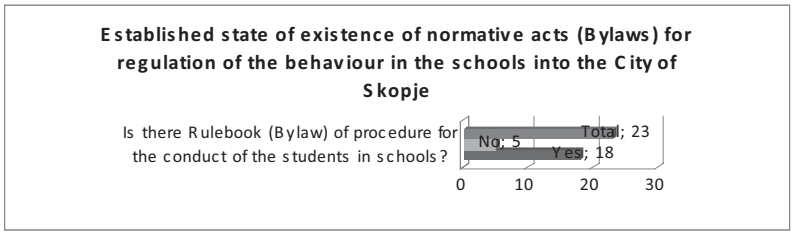
RESULTS AND DISCUSSION

The survey was completed with different types of questionnaires which were given to directors, pedagogues or psychologists in order to establish the security of the environment at schools where they work. As regards these questionnaires and the expected results, it should be underlined that the requested data concerning the above mentioned were only partly or not obtained at all. To be more precise, schools do not have unified methodology for recording data of this type, and according to

the researching team, it is an essential deficiency of schools that in the future should be definitely changed.

As for the question whether there is an internal policy on the behavior of pupils and responsible persons for conducting it at schools, out of 23 schools, 18 responded positively, and 5 did not answer at all. (See Figure 1)

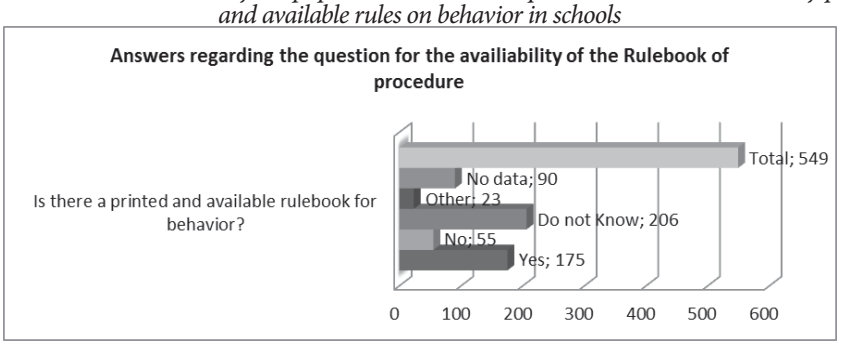
Table 1



The questionnaires also included the question "Is there a printed and available school rules of behavior?" to which 175 out of 459 surveyed pupils responded positively, while 55 responded negatively, i.e. answering to the question whether there was an available Rulebook for the pupils' behavior in their schools, 206 pupils said they did not know, 23 pupils answered other and 90 questionnaires were not answered.

The obtained results show that almost half of the respondents are familiar with the fact that there are rules with regard to their behavior in the school, but the other 55 pupils answered negatively and only 206 pupils out of 459 surveyed pupils answered that they are not familiar with the fact. On one hand, the results have proved that there are certain rules set for the behavior of the students in schools and that most of them know about the rules, while some of the pupils still lack information regarding the behaviour policy. The display of the answers can be observed in the following graph 2. It is symptomatic that 90 questionnaires lack responses.

Table 2 - Answers distributed by the pupils in relation to the question whether there are any printed and available rules on behavior in schools



Competent individuals (directors etc.) were asked about their opinion regarding the role of the parents for the adoption of the rules for the pupils' behavior. The following responses were obtained: in collaboration with parents, conduct consultations and opinion about the rules for the pupils' behavior; not included; not interested; participation by a board composed of parents; through School Board and Parents' Council; they are informed about their child's condition, give a statement and have the right to appeal if they are dissatisfied with the measure; they are informed, and there is a parents' council; oral indication, written warning before excluding and that they are informed about the first parents' meeting.

The children have always been of particular interest to the General, the Professional and the Scientific Community. And there is a big reason for this. Nevertheless, they are carrying out the

seed of the future so this interest must be exceptional. The condition under which young people demonstrate behavior which is contrary to the rules in the Society causes reactions of the society's control mechanisms. It is believed that these mechanisms should primarily refer to assistance and protection of children, and they should not be of repressive or punitive nature.[24]

CONCLUSION

The process of transition of the political, economic, cultural and overall sociological system in Macedonia has caused considerable changes in all segments of the Macedonian society and this fact has especially been transferred to the educational system.These considerable changes are endangering the established moral values generally related to the state or the public property opposite to the new moral values which are based on the private property and the pluralism of the political system. These conditions have enabled endangering of the existence of a number of families.

The race for profit and the fight for elementary existence of a huge number of Macedonian citizens are destabilizing factors for the family, which represents the main "institution" where the children have conditions for comprehensive development. On the other hand the educational system in the last two decades has been on the sidelines of the state's interests suppressed because of other priorities, such as political, ethnic, economics and security which always receive most of the state budget. The decreasing funds for education influence the standards of the teachers, demolition of the school buildings and very poor equipment for the educational process. Families and schools, where children have to spend most of the day trying to find support, understanding and security, face numerous problems and neglect their obligations without taking adequate measures against increasing teenage substance abuse and gambling.

In the last decade, especially after the country has become a candidate for EU in 2005, Macedonia has been harmonizing and unifying its laws with the Law of the European Union, but under the time pressure a lot of problems have arose from the process of accession to the Union.

The obtained results show that almost half of the pupils that were respondents are familiar with the fact that there are rules for their behavior in the school, but the other 55 pupils answered negatively and only 206 pupils out of 459 surveyed pupils answered that they are not familiar with the fact. On the one hand, the results have proved the existence of certain rules for the behavior of the students in the school, but the other pupils apparently lack any information about it.

Bearing in mind that children spend considerable time in their schools daily, their security is essential part of schooling. If we want our children to feel safe, their schools must be focused on and dedicated to the educational and social processes included in the children's upbringing.

When we discuss the problem of school violence, several questions can be raised: First, is this a real problem? That is to say, is the violence among children increasing? Or this is only a result of more responsible and more expressive presentation on the subject by the media? Secondly, how much the ethnic origin and religious beliefs influence school violence, especially in Macedonia? Furthermore, another problem is that while not resolving this situation we are facing extreme ethnical divisions among school children. And as expected, our post conflict society is faced with many problems without finding solutions for almost all of these types of problems. As far as these issues are concerned, we can emphasize the special position of some of the factors, such as: the role of the family, the media the stereotypes, stigmatization and especially the general institutional indifference to profound tackle with the problems and to treat their reasons, not only working on individual cases.

Therefore, the question posed to the parents, teachers, directors and the whole community is: "What can schools do in order to provide protection of the pupils related to different types of security risks?" Although the public attention in Macedonia is directed mainly towards violence among students, there are many other security risks which are present today, or will arise in future. The research team is of the opinion that the solution is in the interaction between the parents, teachers and students. The parents and teachers are the pillars who should bear the responsibility for the actions towards building solid social and psychological beings.

24 See more: Stojanka Mirceva, Violeta Caceva, Aleksandar Ivanov. *Положба на децата жртви на сексуална злоупотреба во македонскиот казненоправен систем,* Годишник на Факултетот за безбедност Скопје, Факултет за безбедност Скопје, Скопје 2010, page 6 – 10.

REFERENCES

1. Арнаудовски,Љ. :(2007) Криминологија, „2-ри Август, Штип
2. Аџимовска Малетиќ Искра, Заштита права детета преко институције Народног правобраниоца (Омбудсмана) у Републици Македонији, Правни живот, Часопис за правну теорију и праксу, Удружење правника Србије, Том I, бр. 9, Београд, 2005
3. Батиќ Д., Малиш Саздовска М., Акимовска Малетиќ И., Николоска С., Мојсоска С., Гогов Б., Иванов А., Безбедноста во училиштата, (Психосоцијални, криминолошки, криминалистички и правни аспекти на безбедноста во средните училишта на градот Скопје), Здружение за безбедносни истражувања и едукација, Нова Македонија, Скопје, 2011
4. Berndt, T., J.(1986). Children'Comments about their Friendships, vo Perlmutter, M(ur):
5. Bodin, D.,: Violance at school, Background paper for the Europe and Central Asia Regional Consultation for the UN Study on violence against Children, Ljubljana, July 2005.
6. Закон за заштита на децата (Службен весник на РМ бр. 170/2010)
7. Convention on the Rights of the Child, Adopted and opened for signature, ratification and accession by General Assembly resolution 44/25 of 20 November 1989, Entry into force 2 September 1990, in accordance with article 49.
8. Sandra Jo Wilson and Mark W. Lipsey : The Effectiveness of School-Based Violence Prevention Programs for Reducing Disruptive and Aggressive Behavior1 Center for Evaluation Research and Methodology Institute for Public Policy Studies Vanderbilt University,Revised Report for the National Institute of Justice School Violence Prevention Research Planning Meeting May 2005
9. Факултет безбедности Београд, (подготвила Ђурић Слађана) „Безбедносни ризици у школама, Модели откривања и реаговања, Београд, 2007
10. Georgievski P.: Društveni kontekst krize škole i oblici školskog nasilja, SOCIOLOGIJA, Vol. LI (2009), N° 1
11. Graham, S., Hoehn, S. (1995). Childrens Understanding of Aggression and Withdrawal as Social Stigmas – An Attributional Analysis, Child Development, 66/4,1143-1161.
12. General Comment No. 8: The right of the child to protection from corporal punishment and other cruel or degrading forms of punishment (Articles 19, 28(2) and 37, inter alia), (CRC/C/GC/8, 2006).; General Comment No. 1: The aims of education, (CRC/GC/1/2001), para.8.,
13. European Commission, DG Justice, Freedom and Security, Daphne Booklets:Issues and experiences in combating violence against children, young people and women, Violance and school, Brussels, August, 2008.
14. Ivanović,Č.: Bezbednosni menađment savremene škole,Zadužbina Andrejević, Beograd, 2010.
15. Menesini, E. (1997). Bihevioral Correlates of Friendship Status Among Italian School children, Journal of Social and Personal Relationships, 14/1,109-121
16. Национален план за акција за правата на децата во Република Македонија 2005-2010, декември 2005, Скопје.
17. Народен правобранител на Република Македонија, Информација од посетите на основни и средни училишта заради едукација на децата за нивните права и обврски, Скопје, 2009.
18. Национална комисија за правата на децата во Република Македонија, Извештај за преземените мерки од Националниот план за акција за правата на децата во Република Македонија 2006-2015 во периодот 2006-2007 година, Скопје, јануари 2008 година
19. Националниот план за акција за правата на децата во Република Македонија 2006-2015, Скопје, јануари 2008 година.
20. Olweus, D. (1998). Nasilje medju djecom u školi. Zagreb, Školska knjiga.
21. Perspectives on Children's Social and Behavioral Development, Lawrence Erlbaum Associates, Publishers, Hillstale, New Jersy, London.
22. Peter K. Smith, Goldsmiths College, University of London, United Kiungdom, Violance in schools: A European perspective

23. Rutter, M.: School Effects on Pupile Progress: Reserch findings and Policy Implications, Child development 54:1-29, 1983
24. Устав на Република Македонија: со амандманите на Уставот I – XXX, Службен весник на РМ, Скопје, 2007.
25. Закон за средното образование („Службен весник на Република Македонија“ бр.44/1995; 24/1996; 34/1996; 35/1997; 82/1999; 29/2002; 40/2003; 42/2003; 67/2004; 55/2005; 113/2005; 35/2006; 30/2007; 49/2007; 81/2008; 92/2008; 33/2010; 116/2010; 156/2010; 18/2011; 42/2011 и 51/2011). Одлуки на Уставниот суд на Република Македонија: У.бр.355/1995 од 20.03.1996 година, објавена во „Службен весник на Република Македонија“ бр.16/1996; У.бр.210/2000 од 16.05.2001 година, објавена во „Службен весник на Република Македонија“ бр.44/2001; У.бр.83/2003 од 19.11.2003 година, објавена во „Службен весник на Република Македонија“ бр.78/2003; У.бр.31/2005 од 15.06.2005 година, објавена во „Службен весник на Република Македонија“ бр. 51/2005; У. бр.102/2005 од 21.12.2005 година, објавена во „Службен весник на Република Македонија“ бр.3/2006 и У.бр.226/2008 од 01.07.2009 година, објавена во „Службен весник на Република Македонија“ бр.88/2009. Закон за стручно образование и обука („Службен весник на Република Македонија“ бр. 71/2006 и 117/2008). Закон за државниот испитен центар („Службен весник на Република Македонија“ бр.142/2008). Закон за учебници за основно и средно образование („Службен весник на Република Македонија“ бр.98/2008), Закон за средно образование („Службен весник на Република Македонија“ бр. 33/2010, 116/2010), Закон за средно образование („Службен весник на Република Македонија“ бр.18/2011, 51/2011)
26. Đurić S.: Strategije za identifikovanje, prevenciju i suzbijanje bezbednosnih rizika u školama, Bezbednosni rizici u školama, modeli otkrivanja i reagovanja, Fakultet bezbednosti, Beograd, 2007.
27. http://www.channing-bete.com/positiveyouth/pages/PATH/PATHS.html
28. http://www.coe.int/t/f/projets_integres/democratie/02_activit%E9s/15_charte_europ%E9enne_de_l%27%E9cole/04_L1_Macedonian.asp

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CULTURE AS A POSITIVE INSTRUMENT FOR POLICE REFORM

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Abstract: Considering why it is important to understand sensibility, values or worldview of individual, but as well of institutional agents, such as police, it is evident that it is culture which offers cognitive and emotional directives in everyday decision taking and in the process of doing security management. The approach that relies on the importance of introducing culture comprehension and cultural changes into the wide domain of implementing reforms in the security sector means a more comprehensive and more innovative way for promoting democratic values within and outside the state competences. In this paper, we will, above all, consider crucial sets of ideas available in various theoretical contexts related to police culture, and thereafter, we will present a referential framework for the analysis of culture and key categories within the above-mentioned concept. On the basis of analytical results, we will define directions for police reform that are founded on synthesizing and spreading of those ideas. An emphasis on central conceptions will provide conditions for developing a set of principles for cultural changes within the police in the security system of the Republic of Serbia. As the final outcome, we will offer a contribution to a better understanding of the essence of police reforms, which is of essential weight in complex social circumstances, when the operation of many institutions, bodies and services is directed towards developing strategies which define in long run developmental goals, prosperity and progress that a society aspires. These conceptions also open possibilities for novel research projects which would enlighten the relation of formal rules and informal practices – as a relationship between "politically correct" language of an organization and value systems which govern operations of the RS police.

Keywords: culture, organizational culture, police culture, police sector reform

INTRODUCTION

Culture is one of the most fundamental domains of social life and a significant factor of identity and development in each country. Due to several bases, culture is ascribed double features; so we can talk about its spiritual and material dimension, rational and imaginary one, creative and destructive one, as a means-resource or as a means-weapon, as a factor of integration or of disintegration, and many others. Throughout human history it has been shown that there were reflections and interpretations of theoreticians who saw culture as a justification for war, hatred and various forms of conflict (Huntington, 1998), but also various attempts to strive for democracy, tolerance and peace right by relying on culture and its values.

Therefore, culture could be both a useful tool and a dangerous weapon, which renders it the central issue within multifarious security problems. It does not derive only because many contemporary conflicts have important cultural dimensions, but also due to the fact that art and culture as resources may be powerful tools for creating working places, mutual understanding, conflict resolving, respect for differences, peace building, creating security and sustainability. Thus, through investment into understanding and affecting the cultural aspects of conflicts, emotional tensions could be alleviated and it could aid to salvation of numerous lives. In the same way, culture and cultural activity can be important means in rehabilitation of communities and individuals at the stage of recovery from conflict, natural accidents and wars, but also in everyday stressful situations in fight against organized criminal, terrorism, and corruption.

Culture could be seen, too, as a potentially efficient instrument of policy for resolving cases of human and societal development, promotion of non-instrumental ways of establishing social rela-

tions of collective identities, as well as for supporting the formation and maintenance of socially sustainable identities, and that of vital importance. It influences development through various forms of expressing attitudes and modes of behaviour related to work, gratification and exchange, traditions of public debates and participations, social support and association, locating cultural heritage and memory, as well as the effect on values and morality.

An especially important role of culture may be recognized when there are at stake cultural changes that could conduce to a wholly different way in which some social issue or problem is conceived that carry security characteristics, too. Its role is also seen in the way the relations between various agents are regulated in the process of attaining higher security and safety level, that lay foundation for starting points and perspectives which give a novel quality and views on the discussed matter. Thereby, its significance is emphasized as well when organizations and institutions undergo certain transformations (like shifts in organizational behaviour or organizational changes) or when they introduce essential reforms which require different or novel cultural features from those exhibited in the past. It is, therefore, important in shaping organizational practices and performances; however, we should not forget cautions of some theoreticians tied to dangers of attempts to reduce the influence of culture in its superficial aspects, as symbols and ceremonies. Namely, we must not exclude or ignore more widespread and deeply entrenched layers of culture, like values and convictions, for they are far harder to be influenced.

In this paper, we argue for an approach which relies on the reflection on the significance of understanding culture and cultural changes in the wide domain of implementing reforms in police service, as a very important institutional subject in the security sector. We have developed that approach envisioning culture as a positive instrument which can be used by the state and its institutions, applying its most important properties of cultivating and shaping human thought and behaviour, in order to advance democratic values within the state in a more comprehensive and innovative way.

CONSIDERATIONS ON BASIC CONCEPTS

In order to discuss and understand the message of this article more easily, it is necessary to introduce into consideration other concepts as well and to open the space for a theoretical discussion on practical implications of the significance of defining the critical role of culture in the operations of the Republic of Serbia police. As it is well-known, in the developed democratic world, both practitioners and academicians share the opinion and admit that culture can exert a lesser or greater influence in the functioning of police officers. They have attained such a conclusion on the basis of elaborated decennial debate and rich research practice. Thus, in better organized states, organizational changes in police are inevitable with the development and/or change of social-economic relations. Whether an adequate attention is devoted to that, and whether culture is interesting enough for the analysis and consideration from the theoretical, and then also from the practical standpoint, may be an independent question for local researchers, theoreticians and reformers.

Since the domestic literature[1]1 is poor on the topic of police culture, we have relied mostly on foreign sources. Police culture can be defined as "the set of values and standards that characterizes policemen and thus influence their manner of behaviour and operation."[2]2 In the USA, the concept of police culture has not changed substantially since the works of Westley in 1970 which relate to the investigation of police culture and violence. According to those reflections, police culture is also defined as "the set of common attitudes, values and norms whose purpose is to direct efforts that emerged from the nature of police job... and from the penal practice of police commanders and supervisors"[3]3. The location of police engagement may be working or organizational environment

1 Here are some of the works in the domestic literature where police culture is mentioned as a concept: Milosavljević, Bogoljub (1997), *Nauka o policiji* [*Police Science*], Policijska akademija, Belgrade; Djurković, Miša, Kekić, Dalibor (2009), „Organizaciono ponašanje i organizaciona kultura u policiji" ["Organizational Behaviour and Organizational Culture in Police Service"], *Kultura polisa*, br. 11–12, str. 639–656; Spasić, Danijela (2011), „Policijska kultura i rodni identitet" ["Police Culture and Gender Identity"], *Bezbednost Zapadnog Balkana*, br. 19, BCBP, Belgrade.

2 D. Van Ryckeghem, 2010, after: *Uputstva za očuvanje policijskog integriteta* [*Instructions for Preserving Police Integrity*], DCAF, 2012.

3 Paoline, 2004, p. 207.

and each of them exerts different influence on employees. The working – external – environment is specific in that it is dangerous, where every citizen may be potentially dangerous.

Relevant studies have as well indicated the existence of two concepts of police culture: (1) as the one, unitary, homogeneous entity, (2) as divided in a series of various typologies. According to the latter concept, values, norms and attitudes among policemen tend to ever greater fragmentation[4]4. Such results point to the existence of ever more obvious individual factors that lead to differences. Some of them are: "changes in the philosophy of police, professionalization, education, gender and ethnic equality."[5]5

Nevertheless, most authors agree that, since all cultures comprise subgroups (subcultures), it also holds for police services. The dominant values and attitudes (culture) of detectives/inspectors/investigators engaged in the most serious offences on the one hand, and traffic policemen, on the other, are not the same, nor the values and attitudes of personnel in uniform and those in plain clothes, too. There are also tensions between national and local police services. Discrepancy in value systems may be manifested through different behaviour of various police subcultures.

Anyhow, it could be said that the importance of understanding police culture lies in the role it plays in everyday functioning of policemen. The bulk of connotations of police culture are negative ones. The negative side of police culture is a consequence of the character of that job, where policemen are permanently confronted with negative, conflicting and dangerous situations. In such situations, bad atmosphere is created where prejudices, brutality and discrimination are developed. Many writers argue that it is culture which is the greatest obstacle to police reform[6]6. Paoline points out the need for ascertaining accountable reaction of policemen in expressing resistance to changes in culture, which most often results from partnership solidarity (no "whistle-blowing" against partners, not to be a "rat" towards partner) and impermeable "blue wall" (blue wall of silence), which conduce most frequently to unsuccessful investigation of police abuses. A problem that emerges here is how to perceive and prevent abuse and/or misperception, misunderstanding and misuse of certain mechanisms which are unavoidable and necessary in everyday police activities, like trust in one's partner, cohesiveness of teams, mechanisms of stress overcoming and the similar. How to develop the proper, and prevent the mistaken professional solidarity and support?

Nevertheless, the analysis of foreign works, above all American ones, devoted to police culture indicates that most of their research focuses on one segment of police work – contingent in uniform, constables, and members of patrol and traffic teams. Thus, "... when a policeman takes his uniform, he enters certain isolated subculture, guided by norms and values created to govern the efforts that emerge on the basis of their unique role in a community"[7]7. Or, as it is quoted by another author, "we must observe that a policeman in patrol has a role in, let us call it, schizophrenic existence: he must suppress not only violence of frequently intolerant and unforeseeable citizens but also intolerance and even tyranny of unpredictable bureaucracy"[8]8.

On the other hand, there are positive aspects of police culture which should not be ignored and which we want to discuss here. As in other professions, common culture aids to the amortization of efforts which confront (police) officers every day[9]9. But, all the same, culture can be employed as a "positive instrument in police reform."[10]10 Finally, the concept of police culture is a useful concept in understanding many aspects of police work, like the skill of introducing someone to the job, investigating police deviances (or their origin), regarding the police responsibility for the success of efforts towards reform.

When police culture is at stake, it represents a sort of organizational culture, too, which is characterized by a series of peculiarities which result from the tasks, means, milieu and structure of police in a specific society. In this connection, it is also necessary to elucidate concepts deriving from that mode of relations and membership. Besides organizational culture, the concept of organi-

4 *Ibid.*
5 Britz, 1997; Frewin & Tuffin, 1998; Paoline, 2003; Paoline, 2004; Paoline, Myers, & Worden, 2000; Reuss-Ianni, 1983; Toch, 1976; White, 1972).
6 Dean 1995, Goldsmith 1990, Green 2000, after: Eugene A. Paoline III, 2003
7 Van Maanen, 1974, p. 85 – after: Eugene A. Paoline III, 2003
8 Brown, 1988, p. 9 – after: Eugene A. Paoline III, 2003
9 Brown 1998, Chan 1996; Waddington, 1999 – after: Eugene A. Paoline III, 2003
10 Crank 1997, Skogan & Hartnet 1997

zational climate is important for empirical research. Although they are similar, there are significant differences between culture and climate, which can affect the way of perception, studying and interpretation, as well as planning, organizing, implementing and evaluating the process of changes. Therefore, when we envisage organizational changes-reforms, apart from the concept of organizational culture, it is important to determine and conceive the concept of organizational climate. Let us observe, now, the most central definitions of these notions.

We would cite only few conceptions of organizational culture:

- organizational culture is a dominant exemplar and common beliefs and values of employees;
- organizational culture is a programme (software) of human mind;
- organizational culture as the collective mind of a firm-organization;
- organizational culture is constituted by common ideas and emotions of employees;
- a coherent organizational culture means that employees share the point of view on things, principles that determine their behaviour and define acceptable and unacceptable social norms;
- organizational culture is the social "glue" of an organization[1111]

As we have already stressed, there is a consensus of researchers that culture is conceptually different notion from climate. Burke, Borutzky and Kaufmann define climate as a perception of the characteristics of an organization (how does it feel to be a member of an organization), rather than the interpretation of events in an organization.[1212] Schnider points out that: "culture is focused on WHY things happen, on the meaning or grounds of events, while climate tells us WHAT happens."[1313]

The difference between the constructs of culture and climate is probably reflected primarily on the epistemological perspective.[1414] The majority of culture studies are conducted within the anthropological and sociological approach. Climate, on the other hand, has the tradition rooted in Lewin's field theory.[1515] *Culture* is, therefore: rooted in history, supported collectively, harder to change; while *climate* is more subjective, temporary and easier for manipulation. From the above mentioned, we can recognize the criteria according to which authors compare culture and climate. It is perceived that the criteria for distinguishing them are not always unambiguous, exhausting and non-overlapping. *The first* has to do with the historical dimension of concepts; *the second* with the dimension collective–personal; and *the third* relates to changeable–invariant.

Why is theoretical and empirical investigation of culture, organizational culture and organizational climate significant at all? Above all, due to influence of culture on performing tasks and achieving assigned goals. When we talk about the link between culture of an organization and success or failure in accomplishing tasks and delineated goals, it is not a simple matter. Strong cultures can facilitate the success in very firm organizations, which deal with the issues of life and death (the military, police, emergency services), but they do not furnish an essential flexibility necessary to adapt oneself efficiently and effectively to novel circumstances.[1616] Even the most firm military organizations have experienced undue expenses tied to the impossibility to respond fast and in a flexible way.[1717]

The precise connection of culture and effect/efficacy of organization will depend predominantly on the way that is studied. Organizational[1818] and/or individual[1919] perspectives are available. It is necessary to pay attention to the distinction of perception according to the levels of organizational hierarchy, and the presence of influential subunits within an organization may have inhibitory or stimulating influence on the effect.[2020]

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11 Obradović, K. R., Cvijanović, J. M., & Lazić, J. M. (2003). Organizaciona kultura kao ključni faktor internog okruženja preduzeća [Organizational Culture as a Crucial Factor of the Internal Environment of an Enterprise]. *Industrija*, 31(3–4), 51–68

12 Sorensen, 2002

13 Schnider, 2000

14 Denison, 1996

15 Lewin, K. (1951). *Field Theory in Social Science: Selected Theoretical Papers*. New York: Harper.

16 Denison, 1996

17 Phillips, Loureries, Millward, Kyriakidou & Gore, 2003

18 Marcoulides & Heck, 1993

19 O'Reillz, Chatman & Caldwell, 1991

20 Cooke & Rousseau, 1988

When police culture is at stake, we must direct the attention to two other aspects. The former is wider and relates to the perception, appraisal and evaluation taken by citizens towards police. The latter aspect is narrower and has to do with organizational culture and climate; with the perception, appraisal and evaluation that is given by employees in police. In addition, we must keep in mind all the subcultures and respect all the organizational differences determined by a specific working position and roles of employees. Research results indicate that subcultures do not always conform to proclaimed assertions on prescribed values of the organization culture. Internal stratification may also take place in organizations whose external image of uniformity and solidarity is very strong (army, police).

All that is quoted leads us to the essential, interconnected features of organizational culture. These are its force, degree of development, scope and homogeneity. The *force* of organizational culture implies its depth, i.e. intensity of influence on individual members of the organization and it could be defined through three criteria: width, depth and comprehensiveness/scope. *The degree of development* is determined by the number of aspects which it covers, strength of attitudes, values and assumptions that define the width. *The scope* is represented by the number of members who accept and apply organizational culture. It is important for strength, for it is never the case that all the employees accept its organizational culture. Scope is linked with the *homogeneity* of organizational culture that is the existence, number and strength of subcultures.

We rarely find a homogeneous, monolithic organizational culture, especially when we talk about great organizations and multinational companies. There are three different, mutually exclusive perspectives wherefrom theoreticians study organizational culture, and they are:

1) the perspective of integration, wherein it holds the principle "one organization – one organizational culture";
2) the perspective of differentiation, according to which an organization has one dominant organizational culture, whose contentions are shared by all the employees, as well as subcultures;
3) the perspective of fragmentation, according to which it cannot be discussed about a common concept of organizational culture, for there is not any consensus on it, but only on the sets of interconnected or unconnected elements that constitute it.

The findings on perception of climate as an element of security and protection in the culture of certain organization are interesting.[21]21 According to O'Tool, working positions which are regarded as secure are conceived as more valuable (in relation to security and protection – including reduction in the number of injuries). *These findings indicate that climate is, in its essence, the way that culture is perceived*. In that way, culture achieves the role of a go-between (of intervening or even moderator/intermediate variable) among cultural phenomena in an organization. Each phenomenon that can affect and modify any of significant elements of an organization requires to be studied in an adequate way and exploited as well, insofar more since it is important for the security and protection of employees – especially in police, having in mind a high risk of daily jobs, at least when personnel in uniform and members of criminal police are at stake.

The influence of these phenomena can be also envisaged through the complexity of spaces, relations, tasks, roles, equipment, goals etc. Police employees accomplish their tasks in a closed and open room, i.e. internal and external milieu. Hence, the internal milieu would be police stations, vehicles and the similar. The external milieu would be that wherein policemen intervene straightforwardly. It could consist of various buildings or an open room. In both situations, policemen meet and resolve various challenges in contacts with citizens who perform their rights, with perpetrators of offences or various criminal acts, and other subjects.

The presumption of danger ("every person who I meet is a potential source of threat") is useful when it relates to lawbreakers, but may have the opposite effects when it has to do with a citizen who attempts to realize certain rights. The same presumption and performance in situations mentioned may lead to different evaluations.

Besides these, of special importance are various sorts of relations inside police – within police station or team. They are multifarious relationships which may influence significantly the efficacy

21 Cox & Flin, 1998; Mearns & Flin, 1999; O'Tool, 2002

of teams, with the change in their homogeneity and cohesiveness or compactness. Let us consider several possible situations. A team composed only from males, of similar age and capacities, with clearly defined roles, is most often very cohesive and professional and friendly relations are possible.

In a gender heterogeneous team – males and females – apart from the cited relations, the possibility of emotional-partnership emerges that can influence the way of accomplishing the task (in military gender heterogeneous units, during combat operations, males devote more attention to the protection of female members of the unit than to the accomplishment of battle tasks). Questions which are also constantly imposed during police functioning throughout the world and in all temporal determinations are: worry about unequal opportunities, discrimination and sexual harassment.[22]22 In that way, above all, empirical issues are open to the existence of the awareness of employees about these complex relations, as well as about the sort and degree of complexity of the above mentioned relations.

Some studies indicate that policemen perceive their own working milieu as full of danger or risk from danger. They declare frequently that they are preoccupied with dangers and violence that surround them, always anticipating both of them.[23]23 So, for instance, Skolnick notices that policemen recognize explicitly an element of danger as the cause of emotional barriers for police job.[24]24

From the previously mentioned, a question ensues: is the existence of monolithic form of police culture possible? We have seen that it is very difficult, even impossible, when we talk about complex and heterogeneous (structurally and functionally) systems. Which sort of changes in organizational culture and/or climate should be planned in order to achieve delineated goals? The answer to this question requires serious examinations of extant attitudes, values and norms of police members, respecting the significance of actual subcultures. Appreciating importance of the concept *Community Policing* – police as the service of citizenship – the research of perception and appraisal of police by the citizens are required. It is absolutely possible that it will signal various typologies of police cultures, i.e. needs for defining the extent and desired types of police organizational cultures.

We can see from the cited works that knowledge of modes of the positive influence of culture and climate should be used as tools in reform – organizational transformations of police – but also as means for regulating and preventing inadequate behaviour of policemen. The basis for a better understanding of the need and importance of the change and development of police culture is offered by diversity of roles occupied by police members. For them, necessary cognitions and skills – competences – are linked directly, acquired by elementary instruction, as well as by constant professional improvement.

In our country, the situation is more complex in each respect. We will try to present it at least to some extent. In contrast with the states of western democracy, we have undergone fundamental social, economic and political changes during the 1990s. When the police is in question, the shift and necessity for reforming militia into police is palpable to the last detail. The structure has been changed, partly the function, too, but the open question of transformation in the mode of employment and administration of police still remains. Although the concept "police state" has been often used in mass-media during that time, serious analyses have indicated that there is in effect the influence of perceptive domination of uniformed contingent (active and reserves). At the same time, other organizational units in police, above all scene of the crime operatives, are characterized by a significant deficit of cadre (the degree of vacancy 35–80%, i.e. replenishment of 20–65%, depending on the sector).

With the political changes in 2000, we enter a new cycle of organizational changes in police and its further adaptation to operating in changeable both local and international environment. Among other things, the police take over the control and protection of the state border, performed previously by the military frontier guard.

Without a more detailed analysis, what is at the moment important for us is to attend the development and opportunities of the concept of police culture in our country and to establish potential

22 Brown, J. and F. Heidenshohn (2000), *Gender and policing*: Comparative Perspectives, Basingstoke: MacMillan, after: Spasić, Danijela (2011), „Policijska kultura i rodni identitet" ["Police Culture and Gender Identity"], *Bezbednost Zapadnog Balkana*, br. 19, BCBP, Beograd.

23 Paoline, 2003

24 Skolnick, 1994

directions of activity, which may be a special challenge to researchers dealing with this domain. A contribution which may result from this article is to ascertain the way of elaborating a conceptual model of police culture which will, among other things, define its departure points, modes of manifestation, as well as outcomes.

CULTURE AS AN INSTRUMENT

Among the issues relating to the state and mechanisms of power available to it, within various theories and concepts, there are more of them dealing with what is to be done than those in connection with how to do that. Great attention is paid, for example, to the employment of force – who, in what way, under which circumstances and to what extent force can be applied – rather than elaborating other instruments which will contribute to the development of power levers at disposal of the state. This paper may serve exactly as a solid basis for shaping the framework for the selection of instruments which would strengthen the state and its institutions, which we recognize in the domain of culture.

As it is well-known, various instruments are used in empowering the state and its position in the international community, as well as in regulating internal institutions. The employment of certain instruments may be public or private, manifested or latent, realized in a positive or negative way and real or prescriptive.[25]25 When foreign policy of the state and implementation of the internal one are at stake, there are many combinations of instruments for which state bodies opt so that policy they practise is more successful and effective.

Strategies in all the operative domains of security structures have to do with the way something is done, too. More precisely, we talk about how to prepare the resources for accomplishment of goals, and *eo ipso* about the means/ends relation. The framework for the reflection on instruments which will contribute to guiding an adequate/successful security politics is set by decision makers (on higher levels of administration), considering how much the instruments match with the relations among various subjects and in different lines of work within security structures. That framework can be designed from the academic perspective or from the perspective of politicians, and both of them deserve attention. Academic perspectives are useful for future policies, for they focus on the characteristics of each instrument, establish their pros and cons/shortcomings and thereby aid decision makers to learn something about them and choose those which will be a constitutive part of their final decision. When we opt for some instrument (as a part of complex analytical process),[26]26 it is vital to encompass some of the following questions:

- Which instruments are available?
- Which instruments will work?
- How should they be applied?
- How much would it cost?
- Which risks do they bring with them?

Therefore, we must also consider what conditions in wider and in narrower environment are necessary in order to apply this instrument successfully, whether there is something that would condition that this instrument is not good, for what strategic goals this instrument is suitable, whether it operates autonomously or in combination with other instruments, how much time is necessary to spend so that the use of this instrument is efficient and similar.

When culture is under discussion, as a possibly positive instrument in the process of changes, although it has a potential to transform the talk (discourse) at the national level about the improvement of operation of certain institutions and represents the basis for the improvement of police work, it often happens that it is not even mentioned within the framework of reforms.

In the attempt to define culture as a positive instrument in a wider sense, we include the ethos (development of norms for the relations and modes of behaviour that create an excellent profes-

25 Terry L. Deibel, Instruments of State Power: Towards an analytical framework, htpp://isanet.cct.arizona.edu/noarchive/deibel.html, accessed 2012-12-28

26 Terry L. Deibel, Instruments of State Power: Towards an analytical framework, htpp://isanet.cct.arizona.edu/noarchive/deibel.html, accessed 2012-12-28

sional culture and ethics), culture of individual organizational units (subculture), high expectations for the work and effect of police, secure/safe environment, common values and relational trust, powerful instructional programmes, high motivation, professional faculty culture, developed partnership with other institutions and wider environment, recognition and acceptation of differences in various domains and so on. In order to achieve these measurable indicators, it is needed, first, to establish the features of extant culture framed within the concept of police and organizational culture, and then to define the type of activity and the aspects of culture necessary to be developed.

As it is already ascertained through the review of domestic literature, there are few attempts considering this phenomenon, and even fewer accomplishing some empirical investigations and in-depth measurements of the police culture in the Republic of Serbia. Much more stimulation is necessary, for developing and promoting something, we must ascertain the present state and opportunities, before we make out a list of desires. To date, we can point out those activities and aspects of culture that have already proved effective (on examples of foreign experiences) and that must be taken into account if an all-encompassing approach to police reform is wanted (an analogous approach can be achieved in other institutions of the security sector, but respecting their peculiarities).

Firstly, we would start from education. Education, as we know, performs tasks of a wider social importance – it directs people and convinces them to human rights, aesthetical, moral, ethnic, national, cultural and universal humanist values, teaches them to understand the necessity of international cooperation and maintenance of peace and security as the existential exigency for all the people. The educational level, quality of education and educational achievements have influence on the fact how a man behaves towards himself, other people, members of different ethnic groups and social strata along various other lines, due to which they separate from the majority. Because of that, it is very important how the contents of educational plans and curricula are determined and constituted at all levels of the national educational system, how and which subjects are educated for the transfer of that knowledge and in what circumstances it is realized.

Police education is one of the decisive factors for defining the future police culture. Insofar, the basic principles and curricula for instruction of trainees/students of the Police Academy are in accordance with the human rights standards and accepted directives for the employment of force; it is easier to fix their attitudes and modes of behaviour in critical moments. It implies, among other things, offering modern programmes and techniques, methods and modifications in the instructional system, situational designs and local actions. This is necessary to be exerted with devotion, expertise, creative employment of resources at disposal, and to show all that through modelling, simulation, experiments, role distribution, decision games based on the scenario technique and the similar.

In this connection, strategic goals are proclaimed implying: the improvement of (police) education consequent to changes, presenting education as a developmental resource at the national and local levels, harmonization with European tendencies and internalization, but also respect for education as an instrument of preserving and developing national and cultural identity.

The following activity is control. In each society, compulsions, prohibitions and duties are imposed through dense network of administration and authority (and institutions). Whether and how they are fulfilled, is tested by a certain established system of control. The control can be explained as a conscious human activity in comparison of the achieved results with an intended or expected outcome. When we talk about control, we observe several segments which are vital to distinguish – what is the level of control, what are the objects and the mode of control. The level of control means the existence of a whole and the existence of individual parts. Sensible elements of behaviour may be the object of the control, but it is difficult to unify and make them uniform, thus the attention is rather paid to economy, efficiency and internal organization as indicators of strength and successfulness or failure. The mode of control implies continuous, constant compulsion, supervision over various aspects of activity, but not only over its outcomes.

The control can be realized by imposing (by indoctrination or by means of cognitive dissonance) of certain cultural values, beliefs and behavioural norms to employees or the subordinated, from the position of authority. When most of the employees accept those values and norms, and embrace them as their own personal rule of thought and behaviour, then the control of their behaviour becomes simple, too. Sometimes organizational and police culture are a stronger control

mechanism of employees' behaviour than formal prescriptions or direct supervision by executives. By means of culture, not only behaviour control is attempted to be attained, but also the opinions and feelings of employees, which, we must admit, is not easy and does not always succeed (while it is, looked in Orwellian way, nevertheless possible). In strong culture behaviour, there is internal control excluding external control, which is not necessary, which is always cheap and inefficient (in that case we might talk about self-control as a higher level of internal control). When police employees accept the strong cultural value that one must not "fiddle", "testify falsely", "conceal the proofs" and the similar, then we can be confident that they will not do that.

Trust is important and necessary, especially in the domain of security, but we must not always rely on it. In the security domain, standards are set as an attempt to make certain security procedures uniform and establish those standards as a measure of their reliability, efficacy and consistency. However, laws and prescriptions may relate to certain standards and must obligatorily be harmonized with them. Each standard is a result of collective work. State institutions, research organizations, security structures and other subjects collaborate in construction of standards that evolve meeting the exigencies of society and technology. Standards are important in all the realms of life and work, but they are especially significant in the domain of security: in security agencies, police, army, customs service and other sectors.

Anyway, it is essential that standards are followed by legal and sub-legal acts. Employees in security structures must be very familiar with the legal system, so, among other things, they need to be informed when the use of force is licensed and know how to employ properly various means of force, including fire arms. An imperative in security structures in many developed countries is that only professionals with a high level of acquaintance with different laws can become team members. Setting of correct and fair standards reduces the probability of anything illegal to be done.

As some of the most important standards for each organization, the standards in the domain of information security and information systems are adduced.[27]27 These standards define the scope of security functions and opportunities, necessary policies for information management and human resources management, regulation of security duties and needs, controls on all levels, techniques for security appraisal and the procedures for dealing with security failures, as well as reaction in critical/emergency situations.

The next activity or aspect of culture is commitment and it may involve several items. The first and most basic is commitment to a set of values, principles or beliefs. This determination implies the existence of a vision and reason why something is done or is not done. A further point refers to a strong feeling of integrity and self-reliance, which means permanent self-improvement, as well as decisiveness and endurance in action to finish something that is initiated, to close it in the best possible way. Support and capacity to amend, i.e. improve the final effect, to set devotion on a higher level, the willingness to search and to find a better way for solving the problem are of special importance, too.

Besides motivation, commitment is ever more regarded as a critical factor of success for implementing knowledge into the management system. There is increasing evidence in theory that employees' commitment to the working place is multi-dimensional and if the attention is directed towards the foundations of commitment, predictions on the intentions and behaviour of employees can be refined.

According to the earliest investigations and Kelman, there are various motivational processes underlying individual attitudes that attend commitment.[28]28 Thus, Kelman cites: respect, identification and internalization. Respect emerges when the attitudes and modes of behaviour are embraced in the view of getting some gratification or avoiding certain punishment. Identification takes place when people adopt attitudes or customs in order to be associated, by satisfying, self-determining relation, with another person or group. Internalization occurs when people accept attitudes and ways of behaviour while their initial content does not coincide with their value systems but it does so in time.

27 The standard ISO 17799 holds as one of the best known standards in this area.

28 H. C. Kelman, „Interests, relationship, identities: Three central issues for individuals and groups in negotiating their social environment", in: S. T. Fiske, A. E. Kazdin & D. L. Schaster (eds.), *Annual Review of Psychology* (vol. 57, pp. 1–26), Palo Alto, CA Annual Reviews, 2006

In culture, through knowledge, control, norms/standards and values, multifarious variants of possible activities are founded that contribute to connecting culture with other phenomena, in order to enable a greater stability of police system, of its organizational-functional structure and of relations built at different levels. In that way, culture assists police to react adequately at unpredictable changes - the greater supplies of cultural accumulation, the more stable police system. Namely, culture provides for the necessary orientation in life and work in a given system and on a wider scale, and for the establishment of more satisfactory relations with others, but also towards oneself. All of that is managed through the development and improvement of all resources in order to attain human ends and for the police to absolutely satisfy the needs of citizens, the system, state administration and of society as a whole.

POLICE REFORM AND POLICE CULTURE

If we understand police reform, first and foremost, as changes in philosophy/conception in practice as well, then it is crucial for the development of a stable democracy, creation of political and social structures which reflect values and exigencies of society, as well as evolution of open market and economy. The changes in police culture represent a visible part of the reform process and thus it is significant, for what is "visible" and if it is also positive, it satisfies the expectations of a wider public and affects the citizens' confidence.

In order to treat police reform more seriously in theoretical and practical terms, it is necessary to identify key principles on which democratic operation of police is based, to determine the meaning of the reform and how it is initiated. Anyway, the working principles are based on the degree to which an organization obeys to the authority of law and society (i.e. responsibility), the extent to which the values of an organization keep up to the values of society and the measure to which the achievements of an organization correspond to the society's needs. These principles are interdependent and overlap with one another to a great extent, but they are not absolute notions, for they depend very often on the context or nature of the society in which police operates. Each of these principles meets the challenges of culture and working practice of a police officer, who establishes different sorts of relations towards other policemen, the whole police organization and towards the environment. In line with that, three levels of the analysis of the policy implementation that promotes the significance of culture in the reform processes can be conducted.

As we have seen, police culture is explained as a functional, even necessary cultural response to the wide, complex and uncertain nature of doing police job, especially through discretionary powers in uncertain and potentially risky situations. Therefore, it serves as an informal guide for the situational behaviour and reaction of a police officer, furnishing informal rules of engagement. Internalized police culture as a form of administration gives directives for behaviour based on guides, interaction rules and prescribed codes of behaviour.

As it is well-known, in 2001 the Council of Europe enacted the *European Code of Police Ethics* as the response to the need to establish "common European principles and directives for general aims, functioning and responsibility of police to protect security and individual rights in democratic societies governed by the rule of law." This document represents an essential step in achieving wide consensus on values and standards demanded from police organizations in modern democratic societies.[29]29 Following the practice of other European countries, the Republic of Serbia also decided to observe the code of professional behaviour which promotes professionalism and integrity as the highest ethical values. So the RS showed, by passing the *Code of Police Ethics*, that it is ready to plead for the highest ethical merits expressed in the prohibitions and duties of police job, encompassing a high level of integrity in its operations, willingness to oppose temptations and abuse of police mantle, and also readiness to obey these values.[30]30

Well-known constitutional, legal and systemic solutions that shape institutions in the security sector (as well as in police), define their competences, licences, rights, obligations and jobs that they deal with. However, what forms practice shows that there is certain inconsistency between strategic determinations and real opportunities for projections of security needs to be realized and estima-

29 *The European Code of Police Ethics*, Recommendation (2001) 10, adopted by the Ministerial Committee of the Council of Europe, September 19th, 2001

30 The Code of Police Ethics, *Službeni glasnik RS* [*The Official Gazette of the RS*], No. 9/2006

tions of capacities to fulfil expectations of all subjects. Thus, for instance, *Development Strategy of Police* emphasizes "strategic principle which will provide also for the development of the Ministry as an institution that is flexible and innovative, and whose approach to security protection is integral and oriented towards citizens."[31]31 It may mean that the traditional model of police work is abandoned as the main way of citizens' behaviour regulation by the use or threat of force, and a new paradigmatic turn in the form of the *Community Policing* model occurs.

By the draft document *The Strategy of Community Policing*,[32]32 although it has not yet been passed, the Republic of Serbia defines the strategic framework towards the elaboration of that model. The significance of culture and changes in organizational culture of police is already indicated in a segment of General Notes stating that "community policing implies elevating the level of consciousness, professional culture and police work through proactive operations and expressing interest for security of a community and respecting citizens' attitudes toward security" (General Notes, paragraph 4). When we talk about external manifestations of police culture, then citizens' attitudes are considerably important (views on security imply their perception of the institutions that are security providers), so we must respect them, especially if they are negative.[33]33

Regarding the relation of police with citizens in the Republic of Serbia, the reports of the relevant institutions (from the state and non-state sectors) show a high degree of citizens' distrust, irrespectively of strategic determination for improving that relation.[34]34 Namely, the *Communication Strategy* recognized the importance of good and efficient communication which enables giving adequately relevant information to society and partner organizations, attaining a corresponding degree of comprehension for the operations of police employees, developing the support for their work and identifying and locating the anxieties, worries and affinities of society and police employees. The implementation of the Strategy should "contribute to the safer life of the whole community, having in mind that police is in service of citizens and its employees are men with clear job identity of citizen protection and preventing all forms of crime."

In this part, it is very important to stress once again the fact that, when we discuss the concept of police culture, culture must not be an excuse for negative occurrence in police, among police officers and in the relationship police–citizens, like: corruption, discrimination, brutality etc. Why are values, rules and acts of behaviour significant for the police reform? As the classical Skolnick's study demonstrates culture that produces certain values, defines rules and shapes modes of behaviour – is transferred through various forms of socialization as a means of confronting with basic aspects of police operations. Skolnick sees these aspects through danger (which lurks all around in environment), authority (as the legitimate capacity of police to apply force) and efficiency (pressure in order to produce a result).[35]35 The traditional characterizations of police culture are focused on description of common values, attitudes, norms within the profession and organizational milieu of police. However, a recent research indicates the importance of encompassing various values and norms constituted within different organizational segments and sub-segments in the police organization.

We have already ascertained that police are not homogeneous. Namely, the distribution of tasks (investigators, special intervention brigades, traffic police and administration) encourages the emergence of subcultures with specific values and norms. The integrity of an organization will not change until these peculiar cultural identities remain in accordance with the wholesale essential

31 *The Development Strategy of Police 2011–2016*, The RS Ministry of Interior, Belgrade, 2010.
32 *The Strategy of Community Policing*, The RS Ministry of Interior, Belgrade, December 2001
33 According to an investigation of the Faculty of Civil Defence [today the Faculty of Security Studies] of the Belgrade University, conducted within the project *A Model of Measures for the Improvement of the Human Security State at the Territory of the Palilula Municipality*, during 2003, among other results, the datum, acquired through method of focus-groups (as a complex type of group interview), was distinguished, that children perceive, above all, policemen as the main factors of insecurity in their quarter. See more in: Sladjana Djurić, "Model istraživanja bezbednosti u lokalnoj zajednici – slučaj Karaburma" ["A Model of Investigating Security in a Local Community – the Case of Karaburma"], *Zbornik radova Fakulteta civilne odbrane*, 2005, Belgrade. Or, more recent results compiled by BCBP (2011), after which two thirds of citizens (76%) cannot single out anything in the work of police which would satisfy them. According to the OSCE data (2008), the efficiency of police in confrontation with problems has been reduced especially in the protection of law and catching felons (there are certain positive shifts, recorded in the first months on duty of the new RS government – the author). See more in: *Godišnjak reforme sektora bezbednosti u Srbiji* [*Annals of the Security Sector Reform in Serbia*], 2012, BCBP & Službeni glasnik, Belgrade.
34 *Strategija komunikacije MUP-a 2010–2012* [*The Communication Strategy of the Ministry of Interior*], The RS Ministry of Interior, Belgrade, 2011
35 H. Skolnick, 1966

values. Subcultures can contribute greatly to the variety of police services, for they reflect implicitly the diversity of society. We must get acquainted well with them and respect them, so that we can direct properly the process of the reform activities, too.

The positive side of police culture also shows that organizational culture in an organization can provide for moral support and generate team spirit necessary for efficient playing of police role and for accomplishing tasks. It can, as well, give a policeman a practical review of ways in which they will exert their duties and lay out a series of work practices that are not taught during basic instruction. Police instruction, as a rule, does not enter into each detail, for there is a series of scenarios possible in the external world, but none is identical with the one trained at the instructional lectures. Police culture will help a young policeman to find his place in his organization.[36]36

A very consideration of the police organizational culture is a constitutive part of the police reform, which represents one of the most complex organizational transformations of an institution in every society, and in Serbia, too. Due to the right for implementation of force and possession of respectable means of compulsion, organizational changes of the military and police are considered the most complex and sensitive ones, wherever they take place throughout the world. Thus, changes must also occur at the level of instruments that we have singled out previously, and they may be traced through the organization of police education, control system, introduction of standards and personal investment, i.e. the commitment to the set of values, principles or beliefs which would render the optimal effect and outcome that satisfies the needs of all subjects.

CONCLUSION

Police is a complex system, organized with the aim of maintaining public law and order, and regularity in society, so, as such, it, in accordance with organizational and functional peculiarities, forms the basis for the development of police culture. Comprising the system of values, attitudes and convictions that determines a policeman's behaviour, police culture manifests in its various relations with job, leadership, citizens, institutions and the society as a whole.

Police culture represents or reflects all that police (police officers) believe. Culture determines and shapes the way of perceiving environment and the way that police react on different situational challenges. It is especially interesting how police (the whole system and organization) adapt to changes and innovations, that can shift significantly "direction of movement" and strategic decisions, which underlie taking a completely new course of operations.

Strategic determinations and beliefs are reflected, among other things, on the way of organizing the relevant ministry and the choice of practice, policy and procedure of instruction and development, and finally, on the actions of police officers in situations of establishing and maintaining public law and order. It is clear that each police service and its every organizational level possess their own (sub) culture. The crucial question is whether culture is developed carefully (implemented in an organized and controlled way) or emerged spontaneously (developed autonomously) and *eo ipso* allowed to develop without a benefit that would be brought by certain fresh reflections or instructions. It is also evident that the culture of each organizational unit predetermines the effectiveness of the whole organization. Culture defines the way police officers see not only their own role but also the people whom they serve – whose service they are in fact.

The key problem is the nature of that culture and whether it reflects a belief system which contributes to the non-violent resolution of conflicts within an organization or in connection with the external environment. How can we establish a positive culture as a positive instrument, which could aid in directing the work of police towards the development of stable democracy, with all the postulates of the legal state? Besides that, we must not forget the fact that we have police culture as the broadest framework of police organization, on the one hand, and police subculture in individual sub-organizational wholes/units, on the other. The once established culture is hard to change. The organizational change within the police apparatus does not occur in a revolutionary way, but in an evolutionary one, i.e. gradually.

36 H. Skolnick, 1966

As we have already noticed, each organization has its own unique culture, as well, which marks the form, degree and speed of changes-innovations. In order to stabilize an innovation, it is necessary to be stimulated and accepted by all the employees at each level. A change will not be entrenched if it is not embraced by top leaders, if they do not believe in its merits, which is especially significant in traditional hierarchical organizations, as in police or, even more, in army. The very moment when it is accepted, the implementation and application go more easily and more efficiently than in all other institutions and organizations in society.

Thus, various elements of culture are in different relations with the social system (the police as a part of that system): certain elements of culture are integrated in the social system and subordinated to it (performing a function of system); others are relatively independent, but do not reach beyond the system boundaries and are not in conflict with it; still, others, in attempt to surpass the extant system, come most frequently in conflict with the societal norms and values. To what extent some elements of culture will be in conflict with it, depends not only on the system needs, its goals and opportunities that, by means of culture elements, policy goals and tasks are realized, but also on the direction of that culture and on the measure in which the value orientation is in accordance or in discrepancy with the value orientation of the social system. Differences and identities may be so deeply rooted in our discourse and thought about the world, whether due to their role in our practical lives or because they are powerful cognitively and represent an important aspect of the way we conceptualize our experience, that every theoretical challenge related to them could surprise us.

A practical problem important for the success of changes results from the demand for measuring culture and climate, as well as from the comparison of results with extant empirical research in our country and abroad. What are predictors, in what way certain climate in an organization and/or a team (especially in complex organizations, like police or military) can be built, changed or maintained? Should we, in general, turn toward changes of organizational culture, in respect of the fact that it is supported collectively, more well-founded historically and is difficult to change? Should we focus on the change of climate, since it is more subjective, temporary and easier to manipulate? What will be long-term and what short-term effects of these interventions? Can they be put into work, and to what extent, individually or in isolation, or is it necessary to conduct them continuously and in coordination? Of course, the following demand and challenge is an operational definition of concepts and acquiring variables, i.e. their measurable representatives.

Any implementation of reforms takes place in a specific national and organizational context. There are, and there must be, serious considerations related to the selection of certain strategy for changes. There are multifarious experiences of societies in transition or post-conflict societies where there has never been a serious attempt to change educational materials and methodologies in order to provide for the adoption of and respect for local culture and often a coordinated plan for an adequate and relevant collaboration in the field of elaboration and exertion of instruction does not exist. In this connection, it is important that police education gives a positive contribution to the police organization and its culture, especially through strengthening a more analytical approach to understanding practical problems and developing solutions and that should be especially emphasized.

BIBLIOGRAPHY

[1]. Ban, C. (1995), *How do public managers manage? Bureaucratic constraints, organizational culture and the potential for reform*, San Francisco, CA: Jossey-Bass.

[2]. Brown, Andrew (1998), *Organisational culture*, second edition, Judge Institute of Management Studies, University of Cambridge.

[3]. Chan, Janet (1996), Changing police culture, *British Journal of Criminology*, Vol. 36, No. 1, pp. 109–134.

[4]. Clissold, G. (2006), Psychological climate: What is it and what does it look like?. Downloaded from: http://www.buseco.monash.edu.au/mgt/research/working-papers/2006/wp29-06.pdf

[5]. Cockcroft, Tom (2013), *Police culture – themes and concepts*, Routledge, London and New York.

[6]. Cooke, R. A., & Rousseau, D. M. (1988). Behavioral norms and expectations: A quantitative approach to the assessment of organizational culture. *Group & Organization Studies*, 13, 245–273.

[7]. Crank, John P. (2004), *Understanding Police Culture*, 2nd edition, Anderson Publishing.
[8]. Deibel, Terry L., Instruments of State Power: Towards an analytical framework, htpp://isanet.cct.arizona.edu/noarchive/deibel.html, accessed 28-12-2012.
[9]. Denison, D.R. (1996). *What is the difference between organizational culture and climate?* A native's point of view on a decade of paradigm wars. *Academy of Management Review,* 21(3), 619–654.
[10]. Djurić, Sladjana (2005) „Model istraživanja bezbednosti u lokalnoj zajednici – slučaj Karaburma", *Zbornik radova Fakulteta civilne odbrane*, Univerzitet u Beogradu.
[11]. Djurković, Miša, Kekić, Dalibor (2009), Organizaciono ponašanje i organizaciona kultura u policiji [Organizational Behaviour and Organizational Culture in Police], *Kultura polisa*, Belgrade.
[12]. *Godišnjak reforme sektora bezbednosti* (2012), BCBP & Službeni glasnik, Belgrade.
[13]. Haslam, A. S. (2004), *Psychology in organizations – The Social Identity Approach*, London, SAGE Publications.
[14]. Kelman, H. C., „Interests, relationship, identities: Three central issues for individuals and groups in negotiating their social environment", in: S. T. Fiske, A. E. Kazdin & D. L. Schaster (eds.), *Annual Review of Psychology* (vol. 57, pp. 1–26), Palo Alto, CA Annual Reviews, 2006.
[15]. Kodeks policijske etike [Code of Police Ethics], *Službeni glasnik RS* [*The Official Gazette of the Republic of Serbia*], No. 92/2006.
[16]. Loftus, Bethan (2009), *Police Culture in a Changing World*, Oxford University Press, UK.
[17]. Marcoulides, G., and Heck, R. H. (1993). Organizational Culture and Performance: Proposing and Testing a Model, *Organizational Science*, 4(2): 209–223.
[18]. Millward, L. (2004), *Understanding Occupational and Organizational Psychology*, London, SAGE Publications.
[19]. Millward, L., Phillips, P., Louvieris, P., Kyriakidou, O., & Gore, J. (2003). Organisation or Organising in a digitised battlespace – A 'human' perspective. Report for QinetiQ.
[20]. Obradović, K. R., Cvijanović, J. M., & Lazić, J. M. (2003). „Organizaciona kultura kao ključni faktor internog okruženja preduzeća" [Organizational Culture as the Crucial Factor of the Internal Environment of an Enterprise], *Industrija*, 31(3–4), 51–68.
[21]. OECD (2002), *Cultural Change in Government: Promoting a High-Performance Culture, A Review of Ten Years of Modernisation: The HRM Perspective*, Paris: OECD.
[22]. O'Reilly, C. A., Chatman, J. A. and Caldwell, D. F. (1991). `People and organizational culture: A profile comparison approach to assessing person-organization fit', *Academy of Management Journal*, 34, 487–516.
[23]. Paoline, Eugene A. III, 2003, Taking stock: Toward a richer understanding of police culture, *Journal of Criminal Justice*, Orlando, USA; 31, pp. 199–214.
[24]. *Reforma policije u Srbiji – ka stvaranju savremene i odgovorne policijske službe* [*Police Reform in Serbia – Towards Creating Up-to-date and Responsible Police Service*], Odeljenje za sprovođenje zakona Misije OEBS u Srbiji i Crnoj Gori, 2004.
[25]. Schein, E. H. (2004), *Organizational Culture and Leadership*, Third edition, San Francisco: Jossey-Bass.
[26]. Schneider, B. (2000). *The psychological life of organizations.* In N.M. Ashkanasy, C.P.M. Wilderom & M.F. Peterson (Eds), *Handbook of organizational culture and climate (pp. xvii–xxi).* Thousand Oaks, CA: Sage.
[27]. Skolnick, J. H. (1994), *Justice without trial: Law enforcement in democratic society* (3rd ed.), New York: Wiley.
[28]. Skolnick, Jerome H. (1966). *Justice without trial.* John Wiley & Sons Inc.
[29]. Smircich, L. (1983), Concepts of Culture and Organisational Analysis, *Administrative Science Quarterly* , 28: 339–358.
[30]. Sorensen, J.B. (2002). *The strength of corporate culture and the reliability of firm performance.* Administrative Science Quarterly, 47(1), 70–91.

[31]. Spasić Danijela (2011), „Policijska kultura i rodni identitet“ [Police Culture and Gender Identity], *Bezbednost Zapadnog Balkana*, br. 19, BCBP, Beograd.

[32]. *Strategija komunikacije MUP-a 2010–2012.* [*The Communication Strategy of the Ministry of Interior*] (2010), MUP Republike Srbije [The RS Ministry of Interior], Belgrade.

[33]. *Strategija policije u zajednici, Nacrt* [*The Strategy of Community Policing, Draft*] (2011), Vlada RS, MUP [The RS Government, the Ministry of Interior], Belgrade.

[34]. *Strategija razvoja MUP-a 2011–2016.* [*The Development Strategy of Police 2011–2016*] (2010), MUP Republike Srbije [The RS Ministry of Interior], Belgrade.

[35]. Swanson, R. A., Holton, E. F., (2001) *Foundations of Human Resource Development*, San Francisco, Berrett-Koehler Publishers, Inc.

[36]. *Uputstvo za očuvanje policijskog integriteta DCAF* [*Instruction for Preserving Police Integrity*], 2012, www.dcaf.ch

[37]. Wood, Jennifer (2004), Cultural Change in the Governance of Security, *Policing & Society*, Routledge, No. 1, pp. 31–48.

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RISK OF READY-MONEY PAYMENT AS A FACTOR OF NATIONAL SECURITY

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Abstract: An important segment of the financial system of each country is its banking sector, which in the days of globalization and the global economic crisis is going through great trials that will determine its future survival. However, this sector is often targeted by other financial organizations and organized crime groups, which significantly hinders its functioning and survival. Risk in the payment system is in the very essence of risk management, i.e. identifying, measuring and managing of risks. Therefore it is very important to establish an effective risk management function, which has been developing in countries in transition for the past decade. The problem to be addressed in this paper is the presentation of the payment system risks, especially those related to cash payments. This problem are reflected in the data showing an annual increase in the number of assaults at the institutions handling cash money transfers, which present a form of challenges, risks and threats to the security of the state in general. The contribution of this paper is the conclusions regarding permanent follow-up of the "know-how" effect of the establishment and functioning of the risk assessment and the establishment of a system for risk assessment and protection, such as, for example, training of personnel who are employed in institutions nthat perform a specific activity, assessment and protection of payment transactions from assault when using cash.

Keywords: payments, national security, finance, banking, risk management.

INTRODUCTION

Payment systems in almost all market economies mostly rely on banks, so that their stability and safety directly affect the risks in cash payments and maintenance of financial stability of the state. The very essence of risk managements has to do with risks in the payment system, or in other words with identifying, measuring and controlling risks. The issue we are dealing with in this paper is risks in payment system, especially in cash payments. This issue has grown in importance given the ever increasing trend of physical assaults in the institutions performing cash payments, which is manifested as a form of challenge, risk and threat to the state security in general. Instead of having normative legislation that will regulate the protection of the physical forms of money, i.e. cash, there is no unified system for assessment of threats to cash payments, which results in an extremely high portion of subjective factors in assessing threats.

During the performance of most transactions it is not possible to manage outcomes but only risks, and in order to make success certain risks must be taken. Financial institutions have to measure risks in all business situations, because if they are able to differentiate between high-cost risks and low-cost risks they can succeed in business. Risk management in its very essence has to do with optimizing profits for the taken risks. Therefore, financial institutions should balance the potential risks they may be facing in everyday transactions, taking into consideration that their business is conducted in an environment full of challenges, risks and threats.

CRIMINAL ACTIVITIES AS A CHALLENGE TO NATIONAL SECURITY

Liberalization of economy and opening of capital and labour markets characterizing the present time have resulted in many negative consequences. They can be observed in "increase in level of criminal activities, which has enabled the organizers of such activities to expand the existing mar-

ket and access new market spaces. Criminal activities are getting more organized, those involved in them are establishing closer and more effective cooperation, organized criminal groups are expanding their operations to the global level, and even nation-based groups of organized crime have started participating in international crime, at least at the regional level. As a result, better organized criminal groups and criminal organizations are becoming more flexible, more sophisticated, extremely opportunistic and involved at all levels of illegal and legal activities."[1]

Experts in the security area argue that the scale of present criminal activities is so big that together with terrorism and corruption it represents a significant threat to national security. The states with unstable social and political systems are especially prone to inducing the phenomena mentioned above.

In addition to the most serious forms of crime such as drug trafficking, illegal migrations, and trafficking in human beings, there has been a growth in white-collar crime. It includes criminal activities such as tax evasion, fraud in commercial transactions, counterfeiting, criminal activities in the area of cyber crime, as well as attacks on banks and banking institutions and money transport vehicles.

Given huge amounts of cash used for payments in banking institutions, the fact that this form of banking business is continuously exposed to activities of criminal groups should not come as surprise. The transport of big amounts of cash from one place to another is another example of how tempting this business may be for those involved in criminal activities, especially if we know that the issue of money transport has not been regulated by the state. Such criminal activities endanger the safety of ordinary citizens and consequently the security of the whole nation.

CASH PAYMENT RISKS

In order to speak about bank operation and payment system we should start with identifying the types of risk[2] that banks may face (Table 1).

Financial risks	Operational risks	Business risks	Contingency risks
Risks conditioned by bank position; Risk of capital adequacy; Loan risks; Liquidity risk; Market risk; Foreign exchange rate risk.	Internal and external frauds; Treatment of employees and safety at work place; Clients, products and business practice; Damages to permanent property; Breakages in business and system failure; Execution, delivery and process management.	Macroeconomic risk; Payment risk; Legal system risk; Legal responsibility risk; Business coordination risk; Reputation risk; Country risk.	Political risk; Corruption; Risk of exposure to banking crisis; Other external risks.

Table 1. Risks to bank operation (source: www.databeuro.com)

Depending on the inclination of bank managers towards taking risks, every bank can accept more or less risk, positioning itself between the two extremes: the absolute risk negligence and the absolute risk acceptance. The level of the accepted risk should be commensurate with the bank's ability to overcome potential losses and gain the acceptable income rate.

1 Cvetković V., *Rizik, moć, zaštita*, Fakultet bezbednosti, Univerzitet u Beogradu, 2010. p. 249

2 Risk can be defined as any uncertain situation in bank operation, or in other words, the possibility of suffering losses as a result of uncertain events in bank operation.

Risk management is not about how to minimize the risk, but how to optimize the reward for the risk taken. An effective function of risk management in banks should, on principle, comprise the following elements:

- Organizational structure;
- Comprehensive approach to risk management;
- Powerful information management system for reporting, tracking and controlling risks;
- Well established framework for procedures, effective control and comprehensive reporting of risks.

Risks can be reduced by taking preventive actions and intensifying precaution measures, with allocating funds for covering losses or transfer of risk to the third party such as insurance companies. It is common to do this through risk analysis, measures aimed at increasing security, overcoming risks, and risk supervision. The essence of bank operations is taking responsibility and risk management. The risks should be identified, adequately measured and managed. Thus establishing efficient risk management is of paramount importance. This function has developed considerably over last years. Today, banks use highly sophisticated statistical and mathematical models to manage risks. In the periods of financial instability, banks face different kinds of financial and non-financial risks, mutually highly dependant, so that an event affecting a specific kind of risk will also have an impact on other risk categories. For that reason, it is very important that the bank top management continuously improve the capacities for identifying, measuring, monitoring and overall control of the risk that the bank takes.[3]

A special form of risk in bank operation, which we will focus on in this paper, is the operational risk resulting from criminal group activities against the bank property.

SAFE PERFORMANCE OF CASH PAYMENTS

Doing business with cash is the most expensive part in the creation of money supply due to the cost of processing, handling and transportation of cash. Despite more widespread cashless payment, increase of cash in circulation is recorded. Although the increase in non-cash operations is recorded, cash operations are the most expensive part in the creation of bank monetary mass with respect to the cost of processing, handling and transportation of cash.[4] Production of cash itself is more expensive due to more sophisticated measures of protection against abuse and similar malpractice.

Safety is not static, nor does it always mean the same level and quality. It is therefore necessary to consider the safety from human, economic and social aspects, placing demands on the financial sector related to the better and more successful organization of operational safety. In view of the different conditions and different areas of social and labour organization in implementing the environmental and business functions, the different types of threats are defined. The sites operating cash are banking institutions that need to be protected through the application of minimum safety measures, then the routes of money transmission and transportation. General safety includes all safety conditions at the global level, while special security within a defined community includes safety operations with cash.

ELEMENTS OF ESTIMATING RISK OF ENDANGERING CASH PAYMENTS

The area of endangering cash operations is very complex. In studying this, different elements can be seen, such as: the subject and the consequences. The subject of endangering cash operations can be divided into the parties and objects of endangering. The parties threatened in cash operations are workers and customers of financial institutions, while the assets (cash) and business processes of financial institutions represent the objects.

3 Popović S,: „Menadžment rizika u bankama“, Ekonomski fakultet Niš, 2004, p . 499

4 Milojević I., Mihajlović M., Cvijanović M., Impact of organizational failure of relevance consolidated budget, Ekonomika poljoprivrede, Vol. LIX, Nº1 (1-176), 2012, pp. 63-71

Vulnerability to the threat of robbery is associated solely with the object of banking institution in case the bank officials are not on the premises. The intensity of threat may depend on the source of threat, but also the phase of the business process related to cash operations. Depending on the source of threat, types of threats may be of low and high intensity. The consequences of endangering cash operations may vary and depend on the implementation of the protective functions of the organization itself.

Depending on the subject, the consequences of threats to the banking institutions may target:

- staff,
- assets,
- business processes.[5]

Research shows that the number of attacks against banking institutions or operations of money transport and transfer of money has been growing steadily, with the number of attacks on the transportation of money falling. This is caused by the fact that the system of protection of money during transport is such that offenders need longer, more complex and expensive preparation for the execution of such criminal act.

Achieving security should include the types of protection and defence measures that will allow the mastering of threat and danger. Some degree of safety is achieved by implementing protection measures that should be an integral part of the organization and execution of the work process. Safety is achieved among other things by organizing and performing occupational safety, fire prevention, private protection and environmental protection, through the application of prescribed and recognized rules and safeguards in a specific area of protection. The purpose of the implementation of safety measures is to prevent accidents, occupational diseases and other illnesses related to work, the protection of the working environment, and protection of individuals and property.

The measures to protect and defend are necessary to oppose dangers arising from the threat. Defensive and protective function has two roles: to protect and defend. Protection can be defined as a function of safety aimed at creating resistance to threat and danger and their elimination. In order to provide safety, protection has a preventive effect. The need for protection is conditioned by the existence of danger or possibility of threat. Unlike protection, defence is a security feature aimed at directly opposing the source of attack and those carrying out threat, and refers to the ability to respond to an active threat or overcome the threat and danger. It is aimed at establishing safety in a given situation. Safety arrangements in cash operations are a prerequisite for safe and normal cash operations, as well as for the development of the organization. The ability of individuals to implement this is a prerequisite for the effective implementation and achievement of satisfactory safety condition. In order to create and manage safety, different standards have been developed in the world, primarily related to occupational health and safety, and information security.

Requirements for integration of all standards aimed at the creation and management of safety in the quality management system according to ISO 9001:2000 is very acceptable. So, if the business system has already implemented requirements related to quality management, good conditions for the integration of requirements related to safety have been created. Given the complexity of the conditions in which processes of threatening and ensuring safety take place, defence and protection are implemented as a single, often simultaneous process.[6]

SOURCES, TYPES AND INTENSITY OF ENDANGERING CASH PAYMENTS

Endangering cash operations is manifested through certain risks and probability of some adverse events. Endangering means impairing safety with the occurrence of hazards and threats to banking employees, customers, assets (money) and business processes (business process interruption). Depending on the origin, sources of threats to cash operations may be natural, social, technical and technological. Depending on where those who perform the threat act from, where threats occur or where they are manifested, the sources of threats can be divided into internal and external.

5 Op.cit. (p. 103)
6 Ericson RJ Balzer, Summary and Interpretation of Bank Crime Statistic, 2003, p. 18

The duration of threat is related to the phase of the business process, as well as endangering sources and methods. Banking institutions are particularly vulnerable to the threat of attack when their staff is on the premises and during the transfer and transport of money from one location to another. Vulnerability to the threat of robbery may be associated with the banking facility when the officials are not in the building, as well as the threat of theft (e.g. ATM).

Basic features or elements of the criminal offense of attack on banking institutions are the use of force or threat to individuals, threat to life, taking away someone else's personal property and misappropriation. It is also necessary to note that in the past there were reports on several attacks on banking institutions in European countries, where the features and elements mentioned above appeared in combination with extortion. The scenario of such an attack on banking institutions implies that a criminal group kidnaps a family member of some of the high-ranking banking employees (executives), who in exchange for the release of their family members allow attackers to reach loot easily.

Modern research has shown that the attacks on banking institutions:

• are mostly performed in urban areas, in a busy environment and in presence of more people, which provides a greater opportunity of concealment and escape,

• are mostly carried out by younger people, because of their physical abilities, mental state and ambition for prompt resolution of existential problems,

• attacks are more often performed by men, while women are rarely perpetrators and more often accomplices,

• attacks are mostly carried out by offenders who were previously registered as individuals prone to crime and violence,

• are characterized by wide publicity.

Attacks on banking institutions engaged in cash operations are: robberies committed in banking institutions and robberies during money transfer and transportation. The robberies committed in banking institutions include robberies committed in banks, post offices, exchange offices, casinos and betting shops. The individuals exposed to attacks during money transfer are generally those who transfer money recklessly contrary to the provisions of relevant laws, using ordinary bags without sufficient precautions and escort in accordance with the regulations. Besides the attacks on banking institutions engaged in cash operations, acts of theft and aggravated theft are also carried out. For the past four years, there have been numerous thefts and instances of debit or credit cards being misused to withdraw cash from ATMs, and in some cases even the ATM thefts by the staff responsible for their filling have been registered.

EXPERIENCES IN CASH TRANSACTIONS

Indicators of attacks on banking institutions operating with cash reflect the security situation in this type of business. The continuous increase in the number of attacks on the banking institutions results in the increase of vulnerability of people and property, in addition to the more extensive material damage. There are a number of reasons that cause the increase in the number of attacks, including inadequate planning of the safety measures. The basis for determining the required safety measures is the vulnerability assessment.

The risk, defined as probability of attack on the bank office (the overall number of the offices divided by the overall number of robberies committed) according to the FBE (European Banking Federation - *Federation Bancaire de L'Union Europene* - FBE), is growing in Europe and is now 1:35, viz. a robbery has been committed in one out of 35 bank offices. It has therefore been concluded that the risk level is 35. ATMs are directly attacked, along with the personnel. The increase in attacks on vehicles transporting money is disturbing, and the use of weapons is not uncommon. Based on the results of research conducted by the FBE it has been concluded that the balance between the expected attack and risk usually affects the increase or decrease of certain types of criminal offenses.[7] Thus breaking into banking institutions where substantial booty is expected is correlated with the use of weapons and types of attack. The expectation of large gain affects the preparation, organisation and equipping of criminal groups.

7 http://www.ebf-fbe.eu/index.php?page

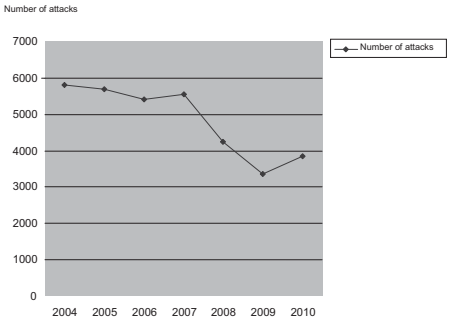

Figure 1. Number of attacks on banking institutions in Europe 2004-2010[8]

In order to address the threat accordingly, banking institutions should start with determining the strategy and concept of protection. The strategy and concept of protection are determined based on the decision regarding the approach to risk management. Safety measures and security of cash transactions can be technical and organisational.

The question which is often asked is whether the banks are safe, viz. how well the cash, when in possession of the bank, is protected and safe from robberies and other attacks on banking institutions. To respond adequately to this complex issue, it is necessary to stress the fact that safety is not the primary goal of a bank. Money transactions are the main activities of banks, and security is a means of support for such operations, reducing the risks that may affect the outflow of cash from the bank. Security should by no means slow down or stop the operation of the bank, as the bank, like all other businesses, depends on such operations.

A large number of workers in the office seem to deter the offender from committing a criminal act. One of the safety measures implemented primarily in foreign countries includes posting signs of warning at the entrance of the offices. Warning signs prohibiting entry wearing a helmet, being wrapped in a shawl or using any other item of clothing hiding the face will draw attention to any person dressed like this entering the office.

Maximum or minimum security measures to be taken by the bank are not legally prescribed. Security agencies should give guidelines and propose to the legislature what minimal technical security measures should be introduced. There is also the question of whether the presence of armed security induces the robbers to be better organised and more heavily armed when attacking a branch office. Practice shows that the security systems of most banks are based on the prevention of theft and that few banks possess cash protection systems to prevent attacks on the banking institutions, especially when they are open and available to the public. Practice also shows that the banks do not take this into account and tend to choose offices which are inadequate security-wise. The layout is frequently such that treasurers need to carry loads of cash through the entire room full of customers to get to the room with the main cash register. Purchasing technical protection systems should be viewed as investment, not an expense.

Bankers point to the fact that the area of transport is not regulated and there are no minimum mandatory security measures to protect cash transported to banks and other banking institutions. Sources of protection are drawn from the bank assets insurance obligation as stated in the Bank Act and the Banking Agencies Act. In line with the regulations governing the manner of engaging police in securing the transport, commercial banks cannot get or hire police to protect the transport of valuable items. This shows that the problem of securing transport is more prominent with relation to the employer. Attacks on banking institutions include: one or two persons or a group of three to seven attackers using two or three getaway cars. When organising transport, banks generally use the classic mode of transportation and money protection i.e. using passenger vehicles belonging to the bank when smaller amounts are transported and special vehicles for transporting money with armed escort consisting of two to four guards.

8 http://www.ebf-fbe.eu

ERRORS IN THE SYSTEM OF CASH BUSINESS SECURITY

Security measures in cash business, i.e. banking institutions, are prone to errors. Errors can be observed only during the analysis of criminal offenses i.e. attacks committed against banking institutions. Based on the regulations, security measures are implemented to reduce the risk and increase the security of persons doing cash business, while protecting the customer is not even mentioned. Practice shows that banking institutions implement security measures to protect the money and not people. This conclusion is drawn from the analysis of the concepts of protection applied by banking institutions. Banking institutions consider safety measures imposed, unnecessary and expensive, as cash is insured with insurance companies. In doing so, the institutions do not take into consideration endangering the wellbeing and life of their own employees or clients who may get hurt in the attacks on the banking institutions. It is noted that banking institutions apply only the minimal safety measures to avoid payment of penalties imposed by the law. At the same time, in order to comply with the required measures, devices of questionable quality and performance are set up and installed, thus presenting expenditures since they do not serve the purpose.

The most common case is that the estimate is retroactive, viz. it is only after the attack that the evaluation is made to determine the security measures. The omissions in the preparation of risk assessment are almost impossible to quantify, since it would require a detailed analysis of all the risk assessments made and the recording of the object the assessment relates to.

Since the measures prescribed for the organisation are not legally bounding, they are often not put into effect. Namely, the banking institutions are required to adopt general acts in the implementation of minimum security measures in their operations which should internally regulate their implementation. If the banking institution has no general act stipulating the implementation of specific measures, it is not required to implement them. Such measures depend entirely on the goodwill of the banking institutions.

This puts the employees of the banking institutions, as the potential victims of robbery, at risk from the first day of their employment. Such extreme conditions require specific preparedness of the people who may experience them. The banking institutions generally do not consider the possibilities of adjusting working hours, methods of opening and closing offices, determining the number of workers, placing warning signs and determining the maximum of cash as measures to help prevent possible offences, and there are few institutions which have developed different procedures to be followed under normal conditions, during, and after the robbery.

The application of security system that achieves these goals creates optimal levels of protection to reduce the risk of attacks on the banking institutions. The implementation of a single type of protection will not help achieve the required level of security, since the introduction of a single system does not help achieve all these goals of a complete security system. Only the integrated implementation of all the organisational and technical measures will influence the reduction of the cash business vulnerability. Functionality and usefulness of the established security system is measured through the level of protection achieved, viz. the number of attacks on the banking institutions and the resulting damage.

The safety system should:

- achieve its preventive goals concerning robbers,
- increase the satisfaction of users of the security system,
- decrease significantly the frequency of attacks on the banking institutions,
- increase the level of security of the clients and employees of the banking institution,
- increase the surveillance over the business processes of the banking institution and employees,
- increase the competitiveness of the banking institution on the market,
- optimize the required organizational and technical security measures implementation.[9]

Security system should primarily be preventive, i.e. they should deter the offenders from attempting crimes.

9 http://www.ffiec.gov/PDF/UBPR/UBPR

CONCLUSION

The rapid development of capital markets, their growing globalization and the introduction of new financial products and technologies have influenced new challenges for the regulatory institutions worldwide. The process of defining new regulations on capital adequacy that will apply not only to banks but also other financial institutions is in progress. Serbia is an integral part of the global financial market whose regulation policies should be aligned with the global trends.

The significance of the research published in this paper is in the given forms of threats to safety of doing cash business as a form of organized crime threatening national security. The overview of theoretical postulates of security in cash business has also included the research and analysis of the references on this issue, as well as the information from the actual banking activities.

Risks accompanying cash payments and threats connected to cash business in banking institutions present a major challenge. Meeting the minimum safety measures cannot ensure managing risks, or prevent the new forms of misapplication from occurring. Practice shows that in some situations, the application of the minimum safety measures is more extensive than required, causing unnecessary costs, while on the other hand it does not meet the required level of protection, which increases the risk to the business.

The conclusion to be derived from the consideration of the whole practice of performing cash payments is the fact that the vulnerability assessment is not conducted by a single system, but rather authorized institutions which perform vulnerability assessment using either simpler or more complex forms of assessment.

Lack of strong commitment of the financial institutions to creating favourable conditions for the safe operation and insufficient participation of other safety factors significantly influencing the creation of conditions to reduce the risk in cash payments have caused a growing trend in physical attacks against the financial institutions that deal with payment transactions. The consequence of this situation is the lack of commitment of the state in making appropriate normative acts to regulate this area.

Development of risk assessment is a basic process to contribute to the proper application of protection, and will be contained in a document defining the implementation of the minimum protective measures for certain financial institutions, taking into account the positive normative regulations. Risk assessment is reduced to determining the probability of events that could pose as a threat for the participants in the cash payment system and business process. Actual facts suggest that the state needs to address this issue and provide documents for safe operation of the banking sector as soon as possible. This will provide a safe environment for the smooth cash payments, as well as the safety of the citizens and the nation itself.

REFERENCES

[1]. Vlada Republike Srbije, „Strategija nacionalne bezbednosti Republike Srbije", Beograd, 2009.
[2]. Dragišić Z., „Sistem nacionalne bezbednosti Republike Srbije" FB Beograd, 2011.
[3]. Ericson RJ Balzer, Summary and Interpretation of Bank Crime Statistic, 2003, p. 18
[4]. Kovač M., Stojković D., „ Strategijsko planiranje odbrane", Beograd, 2009.
[5]. Milojević I., Mihajlović M., Cvijanović M., Impact of organizational failure of relevance consolidated budget, Ekonomika poljoprivrede, Vol. LIX, N°1 (1-176), 2012, pp. 63-71
[6]. Petrović M.,: „Osposobljavanje radnika bankrskih institucija u funkciji zaštite od razbojništva", Zagreb, 2005.
[7]. Popović S,: „Menadžment rizika u bankama" Ekonomski fakultet Niš,2004.
[8]. Cvetković V., „Rizik, moć, zaštita, Fakultet bezbednosti", Univerzitet u Beogradu, 2010.

Websites

[1]. www.databeuro.com
[2]. www.ebf-fbe.eu
[3]. www.ffiec.gov

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811.111'276.6:351.86

ENGLISH INFLUENCE ON MACEDONIAN TERMINOLOGY IN THE AREAS OF SECURITY AND LAW

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Abstract: The paper deals with the influence of the English language on terminology related to security and law in Macedonian within the process of linguistic globalization. This process started after the Second World War when English was promoted into the world lingua franca, i.e. the language of international communication and penetrated all over the globe. The dominant position of English in the world hierarchy of languages contributed to an influx of English words and structures in Macedonian, in both colloquial and formal communication. The tendency of borrowing English words is seen in various domains, but for the purpose of this paper the author focuses on the specific field of security and law. The author will elaborate on the processes of adaptation and integration of integral borrowings, as well as the influence of the English models when translating texts in the area of security and law from English into Macedonian.

Key words: security, law, lingua franca, lexical influence, language

INTRODUCTION

The period after the Second World War was marked by the processes of globalisation which affected all areas of life: economy, politics, science etc., thus transforming the world into a "global village" which contributed to greater integration and interaction among people in all aspects of human life. These globalizing forces also penetrated the field of language and opened the possibilities for the spread of one language to the level of international lingua franca, affecting a multitude of domains of language use. The economic and the political power of the United States of America led to the positioning of English as the language of international communication which also served as an instrument for exercising American influences in various aspects. Being the world's most powerful and most technologically advanced economy, it is not surprising that a great majority of inventions are developed on the territory of the USA and their English names are later adopted worldwide. This is a very fruitful ground for exporting lexical influences on other languages in the forms of English lexical borrowings – anglicisms. The trend of adopting English-based vocabulary has been evidenced in various domains, and the intensity of this inter-lingual transfer is highest in the domains of economy, youth culture, information technology, etc.

As far as the areas of security and law are concerned, we may say that, although to a lesser degree, they have not remained immune to this global trend. This phenomenon is most obvious in terminology related to new forms of crime and legal concepts which emerge as a result of the development of new technologies, particularly in the areas of cyber crime and economic crime. The newly developed security and legal concepts are mainly lexicalized in English and are transferred into other languages either in the forms of integral borrowings or in the form of calques. Macedonian language is considered a receptor of English lexical influences in these areas which are incarnated in numerous integral borrowings: *haker* (Eng. *hacker*), *fišing* (Eng. *phishing*), *skiming* (Eng. *skimming*), *trojanec* (Eng. *Trojan*) etc., or loan translations: *vladeenje na pravo* (Eng. *rule of law*), *razrešuvanje na konflikti* (Eng. *conflict resolution*), *preventivna intervencija* (Eng. *preventive intervention*), etc. Sometimes the need for borrowing English words is justified by the lack of adequate Macedonian lexical forms, but very often a borrowed word is used even in cases when the Macedonian lexical corpus already has translational equivalents carrying the same semantic contents of the English counterpart. This tendency is noticed in words such as *implementacija* (Eng. *implementation*) as a substitute for *sproveduvanje*, *harmonizacija* (Eng. harmonization) for *usoglasuvanje*, *ombudsman* (Eng. *ombudsman*) for *javen pravobranitel*, etc.

Integration of anglicisms in Macedonian

After a word is imported from English, it adapts to the new linguistic system and continues its existence according to the phonological, morphological and semantical rules of the target linguistic environment. In this process of "domestication" the borrowed words pass through a process of integration at all three levels, resulting with their complete assimilation into the target-language.

However, not all borrowed words finish as successfully integrated anglicisms into the host language. There are many cases where an anglicism keeps its original form, mainly in terms of morphology, and continues to be used by the speakers, thus strengthening its position in the lexical corpus of the host language and the English influence both at lexical and morphological level. This is the case with the English borrowing *šelter* which in Macedonian functions as an adjective with its nominal form in expressions like *šelter centar* (Eng. *shelter center*), and does not take the appropriate suffix for derivation of adjectives.

According to Rudolf Filipović, the integration of anglicisms is carried out at three levels - phonological, morphological and semantic, and these three types of integration can be expressed through various types of transphonemisation, transmorphemisation and semantic extension. For the purpose of this paper we will only elaborate on the types of morphological and semantic adaptation of anglicisms illustrated by several examples from the field of security and law.

Morphological adaptation of anglicisms in Macedonian

According to Filipović anglicisms can be morphologically integrated in the following forms:

a) Zero transmorphemisation

This type of transmorphemisation refers to those cases where the free morpheme from the English model is replicated in the target-language, instead of being replaced by a morpheme from its morphological system. (Filipović, 1986: 119-120). This is the case with the anglicism *huligan* in Macedonian which corresponds to the English form *hooligan*[1].

b) Partial transmorphemisation

Anglicisms which belong to this group keep the bound morpheme from the English word in their "counterparts" in the target language (ibid: 121-122). A typical example of partial transmorphemisation is the anglicism *haker* which keeps the bound morpheme *-er* from the English model *hacker*[2].

c) Complete transmorphemisation

In cases of complete transmorphemisation the bound morpheme from the source word is replaced by a bound morpheme from the target language (ibid: 123). This type of transmorphemisation is found in the anglicism *štrajkuvač* where the English bound morpheme *-er* (*striker*) is replaced by the Macedonian morpheme *-uvač*[3].

Semantic adaptation of anglicisms

As far as adaptation on semantic level is concerned, Filipović distinguishes the following types of semantic extension:

a) Zero semantic extension

This type of extension includes those anglicisms which take all the original meanings of the English word. (ibid: 161). Zero semantic extension is typical of anglicisms used for naming new concepts that usually have only one meaning in English. This is the case with the anglicism *spajver* as a newly developed concept in Macedonian which carries the meaning of the English model *spy-*

1 The Anglicism huligan refers to "a tough and aggressive or violent youth". Source: http://www.thefreedictionary.com/hooligan (retrieved on 09.02.2013)

2 The anglicism *haker* is used for a person "who uses programming skills to gain illegal access to a computer network or file" Source: http://www.thefreedictionary.com/hacker (retrieved on 09.02.2013)

3 The Anglicism *štrajkuvač* refers to "an employee on strike against an employer". Source: http://www.thefreedictionary.com/striker (retrieved on 09.02.2013)

ware in its entirety. The noun *spyware* and its Macedonian counterpart *spajver* refer to "software that is installed in a computer without the user's knowledge and transmits information about the user's computer activities over the Internet"[4], and is used in the context of cyber crime. Another word from this category is the anglicism *rekonsilijacija* from the English noun *reconciliation*. *Rekonsilijacija* refers to "the act of reconciling"[5] or "the condition of being reconciled"[6]. It entered the Macedonian lexical corpus after the military conflict in 2001, and is mainly used in contexts referring to the events related to it. Among the most typical collocations and expressions containing this adjective we chose the following ones: *postkonfliktna rekonsilijacija*[7] (Eng. *post-conflict reconciliation*), *dijalog i rekonsilijacija*[8] (Eng. *dialogue and reconciliation*), *rekonsilijacija vo postkonfliktni i podeleni zaednici*[9] *(Eng. reconciliation in post-conflict and divided communities*) etc.

b) Semantic broadening

In cases of semantic broadening the Anglicism takes one of the meanings of the English word and expands it to new concepts or contexts or expands its semantic field (ibid: 169-178). An example of semantic borrowing is the English noun *kidnapper*, whose meaning is English is restricted to a person who takes away or holds a person illegally against his/her will, while in Macedonian the meaning of *kidnaper* is extended to a person who also hijacks planes, trains etc.

c) Semantic narrowing

This type of adaptation refers to cases of lexical borrowing where the anglicism in Macedonian takes only a restricted number of meanings of the original English word. This is the commonest type of semantic extension which occurs in situations when a word is borrowed in only one domain. This is the case with the anglicism *probacija*, taken from the English noun *probation* which originally has two meanings: 1) "allowing a person convicted of a criminal offense to avoid serving a jail sentence imposed on the person, so long as he or she abides by certain conditions" (Oran, 2000:384-385) and 2) "A trial period. A period during which a person's continued employment is conditioned on "making good" in the job and during which the person has fewer job rights than permanent employees" (ibid:385). The Macedonian form *probacija* is used only with the meaning (1).

Semantic narrowing is also noticed in the adjective *preemptiven* which corresponds to the English form *pre-emptive*, derived from the noun *pre-emption*. From all the meanings of the English noun *pre-emption* the Macedonian word *preemptiven* borrowed only its meaning of "designed or having the power to deter or prevent an anticipated situation or occurrence"[10]. The most typical collocations with *preemptiven* include: *preemptiven napad*[11] (Eng. *pre-emptive attack*), *preemptivna vojna*[12] *(Eng. pre-emptive war*) etc.

English influence at the level of collocations

The influence of the original English model can occur at the level collocations which refer to "characteristic word combinations which have developed an idiomatic semantic relation based on their frequent co-occurrence" (Bussmann, 1998:200). Choosing the most adequate collocation from Macedonian lexical repertoire is a challenging task for Macedonian speakers and translators, and failure to achieve this may lead to the adoption of English-based collocations which may sound unfamiliar to an average Macedonian speaker, but their frequency of use in a long term may significantly affect the Macedonian system of collocations.

4 http://www.merriam-webster.com/dictionary/spyware
5 http://www.thefreedictionary.com/reconciliation
6 ibid
7 Utrinski vesnik, 16.10.2006, available at: http://star.utrinski.com.mk/?pBroj=905&stID=13912&pR=3 (retrieved on 09.02 2013)
8 http://nansen-dialogue.net/ndcskopje/index.php?option=com_content&view=article&id=374:education-projects&catid=71:reconsiliation&Itemid=621&lang=mk
9 http://www.nansen-dialogue.net/ndcskopje/pdf/nansen_model_mk.pdf
10 http://www.thefreedictionary.com/pre-emptive
11 Nova Makedonija, 08.10.2012, available at: http://www.thefreedictionary.com/pre-emptive (retrieved on 09.02.2013)
12 Utrinski vesnik, 11.03.2008, available at: http://www.utrinski.com.mk/default.asp?ItemID=74C64189C6D2F043B7DF1C1BD1652013 (retrieved on 09.02.2013)

In this section we will give several examples of the replication of English collocations in the following word combinations:

a) verb + noun

In this type of collocation, the imitation of the English model occurs at the verb level. In spite of the commonly accepted and standardized collocations of verbs with nouns, in certain cases the Macedonian collocation follows the English model. We will illustrate this tendency with the following sub-categories:

a.1.) *Verb+noun* collocations with the English form in the position of the verb

E.g. 1. *to finish a trial* (Eng.) → *finišira sudenje*[13] (Mac.)

This expression is an example of English influence in the choice of the verb in the Macedonian form where the borrowed word does not fill a lexical gap. It is more than obvious that the spread of this collocation among Macedonian speakers is directly influenced by the English model *finish a trial*, and cannot be justified. Instead of *finišira sudenje* Macedonian speakers should use the expression *završuva sudenje.*

E.g. 2. *to complete investigation* (Eng.) → *kompletira istraga* (Mac.)

In this example the borrowed verb *kompletira* is copied from the English model *complete*, in spite of the existence of the Macedonian equivalent *završuva.* The use of an anglicism in this case is absolutely unnecessary and the whole expression *kompletira istraga* should be replaced by its Macedonian equivalent *završvuva istraga* which carries the same semantic contents as its English counterpart.

a.2.) *Verb+noun* collocations where the verb in the Macedonian expression is a loan translation of the English verb

e.g. 3. *to give bail* (Eng.) → *dava kaucija*[14] (Mac.)

In this example, the verb *dava* is a literal translation of the English verb *give* which collocates with *bail*, although in the Macedonian lexical system the words *dava* and *kaucija* do not collocate with each other. The correct Macedonian equivalent of the collocation would be *plakja kaucija*, and should be preferred by translators and speakers in general.

e.g. 4. *to collect taxes* (Eng.) → *sobira danoci*[15] (Mac.)

Although the verb *sobira* is the typical translation of the English verb *collect*, in cases when the relevant institution which collects taxes function as the doer of the action in the sentence, the typical *verb+noun* combination would be *naplakja danoci*.

b) adjective + noun

As far as the *adjective+noun* word combinations are concerned, we will give examples of the English lexical influence with reference to the use of both constituents, classified as follows:

b.1.) *Ajective+noun* collocations with the English form in the position of the noun

E.g. 1. *investigative team* (Eng.) → *istražen tim*[16] (Mac.)

The use of the anglicism *tim* in this collocation is probably due to the lack of an autochthonous Macedonian noun covering the notion of a "team". In Macedonian the anglicism *tim* is the alterna-

13 http://vesti.alfa.mk/default.aspx?mId=36&eventId=44872 (retrieved on 09.02.2013)
14 http://setimes.com/cocoon/setimes/xhtml/mk/features/setimes/newsbriefs/2011/03/09/nb-08 (retrieved on 09.02.2013)
15 Dnevnik, 18.03.2006, available at: http://star.dnevnik.com.mk/default.aspx?pbroj=2989&stID=73485 (retrieved on 09.02.2013)
16 Nova Makedonija, 08.12.2012, available at: http://www.novamakedonija.com.mk/NewsDetal.asp?vest=12812836166&id=9&setIzdanie=22750 (retrieved on 09.02.2013)

tive of the French borrowing *ekipa*, which has a much longer history as part of the Macedonian lexical corpus. In situations of this type, we recommend the use of the French word and the phrase *istražna ekipa* instead of the English form *istražen tim.*

b.2.) *Adjective+noun* collocations with the English form in the position of the adjective

Eg.2. *preliminary investigation* (Eng.) → *preliminarna istraga*[17] (Mac.)

In the case of *preliminarna istraga*, we have a typical example of English lexical influence where the anglicism does not fill any lexical gap in the Macedonian lexical corpus, which makes its use absolutely unnecessary in noun groups of this type. The Macedonian equivalent for the English adjective *preliminary* is *prvičen/-na/-no/-ni*, which leads us to the form *prvična istraga*, as the adequate Macedonian lexical solution.

E.g. 3. *subsidiary protection* (Eng.) → *supsidijarna zaštita*[18] (Mac.)

In the case of *supsidijarna zaštita* we have an integral borrowing which is fully adapted to the Macedonian morphological system. The adjective *subsidijaren* takes the suffix *-aren*, and shows gender and number concordance with the noun it modifies (*supsidijaren/-na/-no/-ni*). As for its meaning, the anglicism *supsidijaren* refers to something which is "secondary in importance; subordinate"[19]. In the context of *subsidiary protection*, it refers to "an international form of protection that is granted to the individuals who were denied the refugee status but who, in the event of returning to the country of origin, will be in a real danger of being seriously harmed"[20].

E.g. 4 *fair trial* (Eng.) → *fer sudenje*[21] (Mac.)

The collocation *fer sudenje* is very frequently used by Macedonian speakers and is based on the English model *fair trial*. In this context the English adjective *fair* is used to refer to something which is "in accordance with the rules or standards[22]". The use of the integral borrowing is absolutely unjustified, taking into account the fact that the same concept is also covered by the Macedonian adjective *praveden* and should be used in expressions of this type. The anglicism *fer* also lacks morphological adaptation, i.e. the derivational inflection for adjectives from the Macedonian morphological system, which is another reason against its frequent use by Macedonian speakers.

LOAN TRANSLATIONS

The English lexical influence can also be expressed through calques, as a way of transferring the English form in Macedonian expressions. A calque is "a new word modeled after a word in another language" (Bussmann, 1998: 151), and is usually used when "the language is adapted to new concepts" (ibid). In cases of calques the English words - constituents of the expression are translated into Macedonian with their corresponding translational equivalents from the lexical repertoire of the Macedonian language in the form of a word-for-word translation. Calques are particularly used in languages whose speakers have negative attitudes towards the influx of words with foreign origin, in countries which have developed highly purist language policies aimed at protecting their official language. However, calques can also be found in languages which are "anglicism-friendly", particularly in the adoption of units larger than a word, which refer to newly developed concept even in English. This type of loan translations is also encountered in Macedonian terminology in the areas of security and law. For the purpose of our paper we chose the following English calques:

17 MTV, 02.03.2011, available at: http://www.mtv.com.mk/mk/vesti/balkan/8956/euleks_pochna_preliminarna_istraga_na_tvrdenjata_vo_izveshtajot_na_dik_marti.aspx (retrieved on 09.02.2013)
18 http://www.mvr.gov.mk/Uploads/azil%20neoficijalen%20precisten%20tekst%2008.01.2013.pdf (retrieved on 09.02.2013)
19 http://www.thefreedictionary.com/subsidiary (retrieved on 09.02.2013)
20 http://www.udsc.gov.pl/GLOSSARY,1096.html (retrieved on 09.02.2013)
21 Nova Makedonija, 29.12.2011, available at: http://www.novamakedonija.com.mk/NewsDetal.asp?vest=122911840988&id=9&setIzdanie=22468 (retrieved on 09.02.2013)
22 http://www.google.com/search?client=opera&q=fair+definition&sourceid=opera&ie=utf-8&oe=utf-8&channel=suggest

E.g. 1 *money laundering* (Eng.) → *perenje pari*[23] (Mac.)

Money laundering is a relatively new concept which was developed in English in the second part of the 20th century. After the introduction into the English lexical system it was imported in other languages in the world where the need for lexicalizing this concept occurred. The metaphor of laundering was used in the context of money and crime in order to depict the process of transforming illegally obtained money into legitimate funds, which is "similar" to the process of clothes washing. The Macedonian form *perenje pari* is formed according to the Macedonian morphological and syntactical rules, with an inverted word order (noun+gerund → gerund+noun), and typically Macedonian morphological inflections (*-nje* for the gerund form (*perenje*) and *-i* for the plural form of the noun (*pari*)). The calque *perenje pari* shows a very high level of integration into the Macedonian lexical corpus. It is also very "active" as far as derivational processes are concerned. Apart from the basic form, there are several expressions in the form of morphological derivates of *perenje pari*. Namely, the Macedonian lexical corpus has also included the phrase *perači na pari*, which corresponds to the English form *money launderers*. It is interesting to note that Macedonian speakers have gone even further, compared to the English "innovators" of the concept, creating an expression based on the model of money laundering which is not present in the English language. Apart from *perenje pari* and *perač na pari*, Macedonian speakers also use the expression *peralnica za pari*, to refer to a place, usually an institution which serves as an instrument for "laundering" the money. The concept of money laundering served as a basis for developing the concepts of *dirty money* and *clean money*, which also have their counterparts in the form of loan translations in Macedonian: *dirty money* (the other name for *illegally obtained money*) is translated as *valkani pari*, while *clean money* (the other name for *legally obtained money*) is translated as *čisti pari*.

E.g. 2 *peacekeeping* (Eng.) → *održuvanje na mirot*[24] (Mac.)

The concept of *peacekeeping* entered the Macedonian lexical corpus in the 1990s as a "consequence" of the military actions in the countries of former Yugoslavia. It is directly related to the presence of foreign military forces deployed in the territories of these countries with the mandate to keep the peace in the post-conflict regions. In the English language this concept is lexicalized by a complex noun, which, in the process of "importation" into Macedonian changed its morphological form and transformed itself into a noun in the form of a gerund followed by a prepositional phrase. The adoption of this modified form is a positive tendency and a model which should be followed in future when adopting English concepts whose morphological form is identical to the form of *peacekeeping*.

E.g. 3 *police officer* (Ang.) → *policiski službenik*[25] (Mac.)

The loan translation *policiski službenik* is a calque with a relatively short history in the Macedonian lexical corpus. Its use among Macedonian speakers has been stimulated by the English model *police officer,* denoting an officer who works for the police. We consider this loan translation unnecessary, due to the existence of a Macedonian word in the form of a single noun – *policaec,* which covers a concept whose semantic contents is very similar to the concept lexicalized by the expression *police officer*. In some cases, the Macedonian speakers even use the expression *policiski oficer* which is almost identical to the original English form. As far as the form of both expressions is concerned, in the Macedonian translation the English noun *police* which modifies the noun *officer* is replaced by an adjective, which is in accordance with Macedonian syntax.

E.g.4. *preventive diplomacy* (Eng.) → *preventivna diplomatija* (Mac.)

Preventivna diplomatija, on the basis of the English phrase *preventive diplomacy*, is a relatively new concept which was developed after the Second World War, but its practical implementation is related to the period after the Cold War. According to the definition from the UN Agenda for Peace from 1992, preventive diplomacy is defined as "action to prevent disputes from arising between parties, to prevent existing disputes from escalating into conflicts and to limit the spread of the latter

23 Dnevnik, 19.12.2012, available at: http://www.dnevnik.com.mk/default.asp?ItemID=7E377C0A410B9D4D8A3DCCE18BD95842 (retrieved on 09.02.2013)

24 http://www.morm.gov.mk/data/file/ARM%20vo%20mirovni%20misii/ARM%20vo%20mirovni%20misii.pdf

25 Vecer, 17.05.2010, available at: http://www.vecer.com.mk/?ItemID=D1371D5061FCB347B354B874321D159A (retrieved on 09.02.2013)

when they occur"[26], and the same semantic contents is transferred to its Macedonian equivalent. The Macedonian equivalent follows the form of the English model *adjective+noun*.

E.g. 4 *restaurative justice* (Eng.) → *restorativna pravda* (Mac.)

The expression *restorativna pravda* is a newly developed concept in Macedonian. It is taken as a direct translation of the English expression *restaurative justice* which means "a system of criminal justice which focuses on the rehabilitation of offenders through reconciliation with victims and the community at large"[27]. The concept of restaurative justice is the same as the concept of reparative justice and its etymology is rooted in the idea of offenders "repairing" the harm they have inflicted to the victim by apologizing for their actions or returning the stolen property. The same semantic contents is transferred to the Macedonian loan translation as well. The Macedonian equivalent has the same form (adjective+noun) as its English counterpart.

E.g. 5 *transitional justice* (Eng.) → *tranziciona pravda*[28] (Mac.)

Tranziciona pravda is another calque which entered the Macedonian lexical corpus after the independence of Macedonia and the military conflict in 2001. It is a direct translation of the English expression *transitional justice* and is primarily used in the context of societies in transition, as is the case with Macedonian society. It basically refers to the process of addressing violations of human rights or severe traumas of various other types with the aim to facilitate the process of transition into a more democratic future[29]. The notion of transitional justice has its roots in the period following the Second World War, when the process of reconciliation included the determination of responsibility for the war crimes and criminal prosecution of their principal actors. However, the expression transitional justice became more extensively used from the 1980s onwards to refer to a broader concept of democratization of transitional societies[30]. As for its form, the Macedonian equivalent is a copy of the original English expression where the adjective functions as a modifier of the noun, which is in accordance with Macedonian syntax.

CONCLUSION

As we could see from the examples presented in this paper, the English lexical influence has not circumvented the Macedonian lexical corpus in the areas of security and law. It is expressed either through integral lexical borrowings, or through loan translations. The integrally borrowed lexical units are morphologically and semantically integrated into Macedonian through the different types of transmorphemisation and semantic extension and continue their existence as part of the Macedonian lexical repertoire, entering into collocation relationships and processes of morphological derivation according to the rules of the Macedonian morphological system. As far as the loan translations are concerned, they transfer the meaning of the original English expressions by replacing the English constituents with Macedonian translation equivalents. They provide a very productive ground for enriching the Macedonian lexical corpus, as more acceptable forms which do not pose a threat to the Macedonian morphological system, being created by genuinely Macedonian constituents. The importation of integral borrowings and calques undoubtedly contributes to enriching Macedonian vocabulary in the area of security of law, but Macedonian speakers should be very careful in the adoption of foreign words which should be used only in those situations when they serve for filling a lexical gap when a need for the lexicalization of a new security or legal concept arises. In all other cases, the use of non-Macedonian lexical forms may pose a serious threat to the lexical balance in these areas, which may occur by replacing existing Macedonian words with their English counterparts. This phenomenon may lead to Macedonian words being used in limited contexts and may ultimately lead to their transition into archaisms, which may be prevented with an adequate language policy in these areas.

26 An Agenda for Peace, preventive diplomacy, peacemaking and peace-keeping (Report of the Secretary-General pursuant to the statement adopted by the Summit Meeting of the Security Council on 31 January): 1992http://www.unrol.org/files/A_47_277.pdf (retrieved on 09.02.2013)
27 http://oxforddictionaries.com/definition/english/restorative%2Bjustice
28 http://www.inpress.com.mk/default.asp?ItemID=3D00837D83BFE24DA1DEB7BA98F5DE9D
29 http://en.wikipedia.org/wiki/Transitional_justice
30 ibid

REFERENCES

1. Bussmann, Hadumon. 1998. Routledge Dictionary of Language and Linguistics. London/New York: Routledge
2. Filipović, Rudolf. 1986. Teorija jezika u kontaktu. Zagreb: Jugoslovenska akademija znanosti i umjetnosti
3. Oran, Daniel. 2000. Oran's Dictionary of the Law. Canada: West Legal Studies
4. An Agenda for Peace, preventive diplomacy, peacemaking and peace-keeping (Report of the Secretary-General pursuant to the statement adopted by the Summit Meeting of the Security Council on 31 January): 1992http://www.unrol.org/files/A_47_277.pdf (retrieved on 09.02.2013)
5. http://en.wikipedia.org/wiki/Transitional_justice (retrieved on 09.02.2013)
6. http://nansen-dialogue.net/ndcskopje/index.php?option=com_content&view=article&id=374:education-projects&catid=71:reconsiliation&Itemid=621&lang=mk (retrieved on 09.02.2013)
7. http://oxforddictionaries.com/definition/english/restorative%2Bjustice (retrieved on 09.02.2013)
8. http://setimes.com/cocoon/setimes/xhtml/mk/features/setimes/newsbriefs/2011/03/09/nb-08 (retrieved on 09.02.2013)
9. http://star.dnevnik.com.mk/default.aspx?pbroj=2989&stID=73485 (retrieved on 09.02.2013)
10. http://star.utrinski.com.mk/?pBroj=905&stID=13912&pR=3 (retrieved on 09.02 2013)
11. http://vesti.alfa.mk/default.aspx?mId=36&eventId=44872 (retrieved on 09.02.2013)
12. http://www.dnevnik.com.mk/default.asp?ItemID=7E377C0A410B9D4D8A3DCCE18BD95842 (retrieved on 09.02.2013)
13. http://www.google.com/search?client=opera&q=fair+definition&sourceid=opera&ie=utf-8&oe=utf-8&channel=suggest (retrieved on 09.02.2013)
14. http://www.inpress.com.mk/default.asp?ItemID=3D00837D83BFE24DA1DEB7BA98F5DE9D
15. http://www.merriam-webster.com/dictionary/spyware (retrieved on 09.02.2013)
16. http://www.morm.gov.mk/data/file/ARM%20vo%20mirovni%20misii/ARM%20vo%20mirovni%20misii.pdf (retrieved on 09.02.2013)
17. http://www.mtv.com.mk/mk/vesti/balkan/8956/euleks_pochna_preliminarna_istraga_na_tvrdenjata_vo_izveshtajot_na_dik_marti.aspx (retrieved on 09.02.2013)
18. http://www.mvr.gov.mk/Uploads/azil%20neoficijalen%20precisten%20tekst%2008.01.2013.pdf (retrieved on 09.02.2013)
19. http://www.nansen-dialogue.net/ndcskopje/pdf/nansen_model_mk.pdf (retrieved on 09.02.2013)
20. http://www.novamakedonija.com.mk/NewsDetal.asp?vest=12291184098&id=9&setIzdanie=22468 (retrieved on 09.02.2013)
21. http://www.novamakedonija.com.mk/NewsDetal.asp?vest=12812836166&id=9&setIzdanie=22750 (retrieved on 09.02.2013)
22. http://www.thefreedictionary.com/hacker (retrieved on 09.02.2013)
23. http://www.thefreedictionary.com/hooligan (retrieved on 09.02.2013)
24. http://www.thefreedictionary.com/pre-emptive (retrieved on 09.02.2013)
25. http://www.thefreedictionary.com/pre-emptive (retrieved on 09.02.2013)
26. http://www.thefreedictionary.com/reconciliation (retrieved on 09.02.2013)
27. http://www.thefreedictionary.com/striker (retrieved on 09.02.2013)
28. http://www.thefreedictionary.com/subsidiary (retrieved on 09.02.2013)
29. http://www.udsc.gov.pl/GLOSSARY,1096.html (retrieved on 09.02.2013)
30. http://www.utrinski.com.mk/default.asp?ItemID=74C64189C6D2F043B7DF1C1BD1652013 (retrieved on 09.02.2013)
31. http://www.vecer.com.mk/?ItemID=D1371D5061FCB347B354B874321D159A (retrieved on 09.02.2013)

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SECURITY STUDIES BETWEEN THE OLD AND THE NEW SECURITY PARADIGM

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Abstract*:* In this paper, the authors argument the standpoint per which the modern security studies share the destiny of their own research topic, for which the disciplinary framework had not been sufficiently developed. Latest comprehension of security is not nearly unanimous, which translates to professional academic research and education in the field of security.

Historical development of disciplines within the conceptual focus of security studies depicts their constant and permanent link to the interests; political, economic, military and ideological tendencies of the states, with security being the sole interest in the traditional, security key. Therefore, the development of these studies can be followed from strategic studies, over studies of international relationships, regional studies, down to modern security studies. Significant changes within the traditional academic matrix are enveloping for (just) some 30 years and are being linked to gradual harmonization of state-centric and human-centric security approach.

Understanding security topics and concepts of extended and deepened research field of security also requires mastering wider disciplinary scope of sciences. To upgrade security of individuals, social communities and environment, apart from military and political sciences, it is also necessary to study social and humanistic sciences, segment of natural and medical sciences, criminology, economic, environmental, demographic and even technical disciplines.

Trends of those studies rely on either old or new security paradigm, depending on predominating trends of social development within which they occur, which may be a function of elementary requirements of states or complex strivings related to the estimates of perspective desired by societies, as to be achieved for their citizens.

Keywords: security, security studies, security paradigm

INTRODUCTION

Claims that security studies research had been unjustly neglected are getting diminishing accuracy. In recent years (although not sufficiently), these studies are becoming an equal subject of studying for security professionals and the educational professionals alike. What seemed to be a monotonous story on yet another narrowly defined and relatively closed field for pedagogy-andragogy professionals, requiring them to devise techniques, paths and ways for the most efficient education had turned into a more interesting opportunity to reach the very philosophical foundations of education profession by expanding security paradigm. On the other hand, security professionals, being present nowadays outside military and police structures, are founding their authority less on administrative and governmental assumptions of power; instead, they are becoming a part of broader scientific community, which approaches the issues of security with scientific strivings. Both of these professionals are becoming aware of mutual benefits, as a consequence of professional communications within specialist closed groups and their own disciplines.

Modern security studies share the destiny of their hard-to-determine subject of study. Examining the relationship between the education for security and comprehension of security inevitably brings us back to the analysis of the entire society within which the education is being implemented. Societal changes also change scientific conceptualizations, which consequentially leads to changes in the field of education. Of course, this is not unidirectional process, thus changes in education also influence society. The importance of education for a society is hard to be overestimated, or to pinpoint its influence on desired social changes, against influences of other subsystems of the society. Yet, we may note without overestimation that the possibilities given by quality education are undoubtedly grand and can contribute to development of social relations and social wellbeing, as well as preservation of the existing, possibly unfavorable circumstances.

The development of academic studying and education of civil professionals in the field of security is in principle being drawn to the period after the World War II and strivings of so-called Western societies to approach the security issue with scientific ambitions or, as some consider, to achieve greater success in utilizing it by relying on the existing faith in science. Whatever the beginnings were, science and scientists, unlike holders of government and their advisors, are not excused from the critics, thus questioning and reinterpreting the initial subjects and concepts of security had significantly changed comprehension of security as the time passed, leading to the change in the very subject of security studies examination.

In last thirty or so years, the expansion of traditional security concept or change of the emphasis within the existing one is obvious. It is usually considered that this had occurred with commonly contested, but still very influential and referred to book by Buzane *People, States and Fear* (Buzane, 1983), and is so widely spread in the science today that we are speaking of the new security paradigm. Our approach to the security is significantly changing and will continue to do so in the future. The need to reevaluate the accepted beliefs in this field is much more current than in some other, more developed disciplines. Many issues of the wider significance now lack firm consensus of scientists and single-mindedness of professional judgment, thus it is conditionally possible to speak of the existence of old and new security paradigm.

Lecturing practice suffers unequal influence of various research traditions towards security curricula and studies, especially on, conditionally named, borderline areas of this field. Therefore, we shall indicate how these various, and often contradictory concepts influence or may influence the security studies.

SECURITY PARADIGMS SHIFT

Scientific community does not find it fully indisputable if security sciences (plural) or security had witnessed paradigm shift, or it would be more appropriate to say that the old and the new paradigm coexist. Part of the problem occurs due to the vast number of meanings contributed to the term *paradigm*. In its most frequent meaning, it particularly assumes a certain quantity, set of common beliefs, as well as previous theoretical, methodological and philosophical determinations. Accepting the common disciplinary matrix, in fact, makes the researchers members of a scientific specialty. Outside that community, the issues of security, on almost regular bases, are being perceived in the traditional, state-centric key, in accordance with the old paradigm. In that sense, the circle of researchers not doubting that we may speak of the new security concept (Dulic, 2006; Kerr, 2006) or emerging paradigm is ever-growing.

A scientific field, however, is never fully identical to the lecturing contents being a vehicle for studying its key concepts and topics. Security studies may therefore find themselves between the two paradigms, or rely predominantly on one of them. The very scientific study of the security phenomenon is relatively undeveloped, together with terminology used, term hierarchy development, selection and choice of contents within the conceptual focus of this field. As for security studies, this is significantly aggravating circumstance, which in some environments leaves the impression of eclectically merged fields. The greatest contribution to the security studies development is therefore given by the efforts of security researchers to define subject areas and concepts constituting conceptual framework of this emerging scientific field, symbolic generalizations and used terms, followed by accepted models and analogies. With an increase in the level of consensus on fundamental theoretical issues, the ambiguities regarding the method for education and reproduction of community to inherit present researchers and practitioners in the field of security would also diminish.

How did, hence, various security concepts attempt to design the world and security experience therein? Studying the path passed by the security sciences indicates their permanent and firm link to the interests, political, economic, military and ideological tendencies of states, with the security being the only topic of interest for a long time. Apart from the experience of cooperation, security was achieved by various forms of violence against the ones seen as a threat, continuously throughout the history.[1] Through society organizing and social roles specialization, the security affairs had

1 These claims are easier to understand if we remember that "the ancient history, as well as the history, teach us that good people do not win; at best, we are the heirs of numerous merciless victories, and heirs of genocide

became one of the basic functions of the state, which had been achieving them by means of special societal structures, such as military and police. Thus, non-scientific, lamer thought on security, and subsequent research with scientific tendencies, had been directed towards security of the state and studying the war as predominant threat for centuries. Only with the development of international relationships and democratization of modern societies, the option of different understanding of security gains on significance. As the fragile crust of civilization was hardening, so did the human culture gain its strength, in the sense of creation and "added value" for the foundation given by the biological base of human being and its nature. Thinking was extended from mere survival in the world of uncertainty towards the quality of life, as the condition for security.[2] Understanding of security in latest history had been transitioning from traditional, state-centric, towards a more complex, human-centric approach. Fundamental differences between the two originate from focusing on dominant object of security, which further indicates different recognizing of threats to security, hence ways, means, resources, including human resources, considered relevant response to threats defined. Some authors summarize a definition of the academic field of security research in the similar manner, looking for answers to several key questions. For Terriff (Terriff, 1999; in: Simic, 2002:22) a comprehensive definition of security can be given only after making decisions on:

- "Who or what is the object of security?
- What is the nature of the threat?
- Who is responsible for (takes care of) security?
- What procedures, resources and methods are employed to achieve, preserve and upgrade security?"

A set of central questions for security studies is presented by Williams (Williams, 2012:44) to be also found around "four basic questions establishing their intellectual core:

- What is security?
- Whose security are we talking about?
- What can be viewed as the issue of security?
- How can security be achieved?"

This consideration brings us back to various philosophical foundations of different approaches to security. The essential difference in answer to the question "*What is security?*" refers to the dilemma if security is achieved by diminishing the threat towards the values we protect (security from) or it is achieved by increasing our liberties (security for) (Cvetković, 2010). Significant contributions to the second, emancipator aspect of security is being found predominantly among peace researchers, for whom disabling one to achieve the capacities due to the structural or cultural facts is also considered the form of violence (Galtung, 1990), thus it is within the scope of these studies.

Significant contribution to conceptualization of security has been found in the field of the international relationships sciences and had been developed, so to speak, through two traditional concepts and through the approach of critical security theories (Hyde-Price, 2001:30). Traditional security concepts, through numerous variations of state-centric approach, emphasize the state as the dominant object of security and the war as the dominant threat. Although they start from these common premises, the two "schools of thought" consisting of realists and liberal institutionalists reach different conclusions. The former ones find the main backbone of the state in eliminating the threat of war and in protecting territory is in capacities necessary to wage a war, firstly armament and military power. Thinking in the format of the "security dilemma",[3] one of the paradox consequences is, in fact, being brought by increasing non-security, if all the states would behave in the same or similar manner, by constantly lifting the level of the "fear balance".

– at worst. It is quite possible that we originate from the people who had been eradicating their adversaries on regular basis." (Rajt, 2007: 45)

2 Perhaps presentation of "security personification (*Securitas*) as a female figure with scepter, gloriole and horn of plentitude on the coins of Roman emperors" (Dimitrijevic, 1973: 12) is not quite accidental. Apart from the symbol of reign, promising and warning that the Emperor cares for his subjects, the horn of plentitude, as a symbol of wealth and happiness, also associates to a more complete and complex conditions for feeling secure.

3 The term "security dilemma" was devised by John Herz (Herz, 1950, in: Volc, 2008: 205), borrowing it from mathematical concept known as Arrow's Theory of Impossibility, and variation of "prisoner's dilemma" model developed in the game theory.

The supporters of the second approach note that the anarchy of the international system can be overcame by cooperation through institutional integration and strengthening multilateralism. They note the importance of appreciation, apart from the "hard" military power, and so-called "soft power" of the state, which relies on the development and consolidation of democracy, resolving economic and environmental problems, strengthening human and social rights, favorable image held by others on material and non-material values of given society, including security issues. Even the most rigorous realists could not dispute that numerous security-relevant problems cannot simply be resolved by military or other resources of coercion.[4] Approach of liberal institutionalists had significantly distanced the issues of security from strictly military determinism and had taken those issues out from narrow strategic and into wide security discourse.

Significant contribution to enrichment of security discourse was given by critical security theories, which constitute a wide range of "idea streams of post-Marxism, feminism, peace studies and post-modernism" (Simić, 2002:55). Many of them involve not only expansion of the field of observation, but in fact the essential change of focus which, while acknowledging state and its needs, introduces individual, various group reference objects of security and environment in the security discourse. By doing so, these problems are not necessarily being approached from the standpoint of their relevance for the strength and power of state or yet another possible cause of war, but from emancipation potential they hold for strengthening human rights and conquering liberty.

The idea that the center point of security belongs to human, individual, had been formulated in Buzan's sentence on inconsistency between security of state and "small and fragile universe of individual security" (Buzan, 1991:48), had been promoted on the highest level, within the 1994 UNDP program. It depicts the new standpoint on security, new sensibility, which indicates that the security, as cultural creation, is living, dynamic and changeable value. This approach provides balanced treatment for complex and numerous dimensions of security, such as: personal, environmental, economical, political, social, health and food security (UNDP, 1994:25). Insisting on human rights, freedom from fear and debarment, individual, gender, racial, class and other liberties is important for daily life experience as much as grand state topics. Later research, however, clearly arguments that the security is not neutral in any of these forms. In the same state context, differences in class, race, origin or gender may mean the difference between security and non-security (Vitworth, 2012; Kaufman, 2012).

Expanding spectrum of security issues, according to some opinions, make the security concept too elastic, fluid and indefinable. Topical discussions and confrontations are essential characteristic of any improvement in scientific knowledge, although in the field of security such events are often cloaked with suspicion of suppressing and shadowing more urgent issues, thus facilitating manipulation and misuse. The deepening gap between the developed and undeveloped parts of the world make the emancipation security concept appears incomprehensibly far and luxurious for some parts of the world. Yet, the approach according to which only state and the most brutal threats are included in the narrowest conceptual focus of security studies would leave independency for the far future of continuously present, cumulatively equally detrimental issues of everyday life, and especially any possibility for emancipation and going beyond what is achieved. From the doctrine of self-esteem in such extremely important issues may probably bring more harm than benefits.

ANDRAGOGY SUGGESTIONS

We had shown that development of security studies is still shadowed by myriad of ambiguities, which negatively reflects on the development of security studies, making scope and contents of education for security works vague. Planning and programming of education in this field is, however, founded on the same principles as any other specialized education, as a special form of education as general phenomenon.

Key dilemmas of any professional education, especially the one financially supported by the state, start from establishing educational requirements of the society for certain knowledge, skills

4 References in this field usually reminds on the documentary film L. Moore "*Top Guns and Toxic Whales*" from 1991, which was true challenge towards views of national and global security of the time. Top fighter pilots are not the answers to the key problems of environment pollution.

and attitudes to be held by a certain group of people to perform specific works for the society as a whole. Due to permanent and generally accelerating changes, these requirements continuously develop and change. The true challenge for education planners and programmers is not only to follow, but also to meet, and even to the certain point create those changes. Although comprehending educational requirements is a general problem of education, it was covered by the traditional didactics to the lesser extent, mostly relying on andragogy science to conceptualize educational requirements, predominantly as the issue of linking the work and the education.

The significance of establishing educational requirements reaches much further, down to the very philosophical foundations of education and purposes of this process. Various societies have different predefined assumptions in the background of their education policies. They influence, to greater of lesser extent, education systems, including systemized knowledge being foundation for professional activities. According to some estimates, modern changes in contents and methods of education are not sufficiently elaborated, thus trends are visible all over the world which seemingly indicate the crisis of education objectives. The core of those issues is unresolved dilemma of understanding development, which can be measured by economic growth, profit and increase in the Gross Domestic Product, which does not have to account for humanistic principles; or the model of human development dedicated to democracy and human life dignity (Nussbaum, 2010).[5] As per its basic properties, the same pattern may be noticed in two security paradigms, depending if the principles of equality are being observed and if the need for security is being recognized for individual social groups, environment and individuals, or a controversial norm is being accepted, by which the secure state means secure individual.

Andragogy concept of educational requirements differentiates educational requirements of an individual and those of a society. They are both usually understood as the lack, discrepancy, gap, difference, which exists between the existing and desirable, optimal state; which can be compensated by initiating educational action (Pastuović, 1978; Savićević, 1989; Despotović, 2000; Kulić, 1997, McCawley, 2009). In the individual context, the difference refers to "knowledge, skills and attitudes necessary to successfully perform a function or a task, followed by knowledge, skills and attitudes already held by the staff to perform these functions and tasks" (Pastuović, 1978: 103). From the societal standpoint, educational requirements are often equalized with staffing requirements, market requirements, or the requirements of the society for the appropriate number and quality of human resources holding wider and deeper knowledge from the missing areas or fields. If educational requirements of an individual and a society are being viewed in wider sense, not just as the gap to be filled, than the education may significantly influence human's self-actualization and development of a more humane society. Changes initiated in this manner originate from "internal subjectivity" and "authentic incentives" of the individual (Despotović, 2000:13), as well as the possibility for the mankind to carefully predict and responsibly and creatively manage development and creation of the opportunities that may be achieved.

If we comprehensively examine educational requirements, we may notice the current and the perspective component. The role of the educational system is to meet the emerged, existing requirements, or more desirable, to meet future, predictable ones. In this manner, we strive to achieve delicate balance between new requirements, time period of education process duration and response to the requirement. Education system must be avant-garde to avoid creating staff for past requirements, since that way it would contribute to outdating by itself. It should include contents and methods of importance for the standpoint of future – the future which could exist "if the societies would figure out their best possibilities" (Šušnjić, 1999:11).

In the field of professional capacitating of security staff, the goal of determining educational requirements is to overcome uncontrolled and arbitrary planning of a certain number of staff to perform the works in the field of security, as well as to devise contents and methods of education to contribute to optimal development of attitudes, knowledge and skills with this staff. Our analysis would not be complete if we had considered educational requirements in abstract view only, i.e. without linking them to the two previously mentioned, significantly divergent security concepts,

5 As an obvious example, the author points out South Africa (South African Republic), which regularly topped development index charts in time of the apartheid, altough its development model was acompanied by distinct unequality, regime brutality and lack of health and educational system for the vast majority of citizens.

which are not necessarily conflicted. Wide, multifunctional understanding of security may involve its traditional understanding as well. Security affairs congruent with the old security paradigm have clearer profiles and reinforcement through the array of developed institution. Their field in various environments consists of different professional activities, ranging from military-police, down to work safety and health. New security paradigm, being still too fluid, not only hinders research and education in security, but also fails to indicate possible jobs. Those are yet to be created in various multidisciplinary fields, to be shared by the security staff in the future with professionals from similar and bordering fields.

In practical operation, appreciation of various aspects of educational requirements for the process of professional capacitating of security staff has the consequence in a very particular form of security studies institutionalizing. In some societies or historical periods, a certain development philosophy shall highlight considering only the current requirements or only the traditional security works. In that case, society usually decides to establish institutions of military and police education, which are considered sufficient to meet the requirements resulting from the security works in the traditional sense.

If social circumstances from the standpoint of social security are at least partially favorable, it is possible and desirable to access the issues of democracy and freedom as the issues of security. In that case, human security, position of individual social groups, economic, social, environmental, health and other dimensions of security are becoming the legitimate subject of security studies. The answer to marring or threats to newly-recognized reference security objects is not as wrong as it is incomplete to search it only within the state, its power and traditional security actors. In such circumstances, it is expected for the security studies to obtain the appropriate attention both in academic circles and institutions, thus universities establish departments and faculties of security studies. The search for the new balance between military and police educational institutions and civil, university institutions will be the long-lasting one.

Methodological approaches to be used for examining educational requirements in the field of security must also observe andragogy rule sets. They clarify which approaches, key sources and informers dedicate resolutions in security staff education. Commonly used inductive approach has the advantage by disabling non-realistic "invention" of future workplaces and occupations, as well as identifying desired and real situation. It relies on the existing work and workplaces, with the key informers on the requirements and lack in knowledge and skills are the employees themselves. Shortcoming of this approach streams from failure to consider the important distinction of individual educational requirements against all other requirements. Seeing the educational requirement, the individual regularly agrees with the lack of certain knowledge and the necessity to acquire them. Since the knowledge is the very thing he/she lacks, the individual must rely on someone else who has that knowledge to estimate the severity and type of gap. Opinions and desires of the students, in this perspective, may or may not be relevant from the standpoint of educational requirements. Shortcoming of inductive approach is the fact that it leads to capacitating for the present situation, which is likely to change during the education period.

Deductive road to comprehend educational requirements is just as valuable, or even more appropriate for the university education, especially due to the necessity to consider perspective requirements. They may be recognized in empirical and inductive manner, since the current state of the society does not indicate it is the right state. Therefore, the key informers on requirements may be norms and standards presented by persons planning the development in some manner. Some of them are of course members of scientific community, conceptualizing theoretical issues of security, top representatives of political government, professionals shaping the security policy and creative individual from the workforce. By combining both approaches and equally valuing current requirements and workplaces with possible development in the future is the set of procedures which jointly may provide the best results (McCawley, 2009).

EXISTING STUDIES IN POST-YUGOSLAVIAN COUNTRIES

Current state of undergraduate academic studies of security in the territory of the former SFR Yugoslavia indicates that these studies, as expected, mostly rely on the old security paradigm (Katić,

2011). In some environments, they are within the field of international relationships, regional and peace studies; while in the other ones they cover criminalistics and criminology, with multidisciplinary approach being extremely rare. Former studies of defense in modern setup are being studied at the faculties of political or social sciences (the Faculty of Social Sciences in Ljubljana, the Faculty of Political Sciences in Sarajevo, and the Faculty of Philosophy in Skopje). Dedication to the security in the sense of internal security of importance for police work may be found at the faculties emerging from former police academies (the Faculty of Security Sciences in Maribor, the Faculty of Criminalistics, Criminology and Security Studies in Sarajevo, and the Faculty of Security Studies in Skopje), while the Faculty of Security Studies in Belgrade nurtures the balance of four key fields: security studies, studies of human and social resources management, civil and environmental protection studies and defense studies. Serbia also has the Faculty of Work Protection in Nis deducated to a very narrow, technical-technological segment of security.

Within the traditional academic matrix of security studies, curricula are being continuously changed and appending by including contents of importance for the new security paradigm. This process is slow and wavering, and it does not even follow strategic security trends of those societies, stated in the appropriate strategic documents. If standpoints within the strategic security documents are to be considered one of the indicators for norms and standards to be achieved, that is a clear expression of educational requirements of society for new knowledge and skills. Striving of the society towards the European Union accession, for instance, indicates the necessity to study key concepts and norms of that organization; standpoint of importance of the environmental protection for the security as well; prevalence of information threats makes the fact that some of these faculties do not include information technologies and foreign language questionable. Far confirmed positive role of non-state actors should also be followed by studying forms and importance of dialog with civil sector to achieve security. Even by implementation of deficit concept in education policy and planning, security studies need to be reinforced by studying social and humanistic sciences, parts of natural and medical sciences, economic, environmental, demographic and even technical disciplines. Planning only by deficit, in general, as shown in this paper, is inappropriate since it may rely on fully undeveloped work, especially since it does not recognize development and perspective requirements.

Since the education is a life-long process, it is clear that wide and disputable field such as the field of security will see numerous important contents remaining outside the curricula, thus the knowledge on those will be obtained by the security professionals throughout their professional and biological life. Therefore, it is important to insist on fundamental conceptual (contextual) knowledge to provide critical attitude, understanding concepts, terms and facts related to security, by combining them with procedural knowledge indicating the methods for resolving particular problems. Skillful operatives in the field of security without solid ethical and theoretical foundations may be just as useless, or even damaging, to the future of democracy and emancipation potentials of security as theorists without the touch with real life.

Procedures for security studies designing, planning and programming may be envisioned, in military jargon, as aiming at the moving target: if we want to hit bulls-eye, we must go ahead of events. Everything else will fall behind the existing capabilities and requirements of a more humane life.

REFERENCES

1. Brown, S. (1998), „World Interests and the Changing Dimension of Security“, in: Klare. M. T., Chandrani, Y. (eds), *World Security – Challenges for a New Century*, New York, St. Martins Press, (1-17).
2. Buzan, B. (1983), *People, States and Fear: The National Security Problem in International Relations*, Brighton, Wheatsheaf.
3. Buzan, B. (1991), *People, States and Fear: An Agenda for International Security Studies in the Post-Cold War Era,* 2nd edn, London, Harvester Wheatsheaf.
4. Cvetković, V. (2010), „Filozofski osnov nauka bezbednosti“, *Godišnjak Fakulteta bezbednosti*, Beograd, Univerzitet u Beogradu, Fakultet bezbednosti, (55-62).

5. Despotović, M. (2000), *Igra potreba – andragoške varijacije*, Beograd, Institut za pedagogiju i andragogiju Filozofskog fakulteta u Beogradu, Andragoško društvo Srbije.
6. Despotović, M. (2009), „Primena koncepta deficita znanja i veština u politici i planiranju obrazovanja – Slučaj jedne tranzicione ekonomije", *Andragoške studije*, Beograd, 1, (67-87).
7. Dimitrijević, V. (1973), „Bezbednost i politička zajednica", u: *Pojam bezbednosti u međunarodnim odnosima*, Beograd, Savez udruženja pravnika Jugoslavije, (7-38).
8. Dulić, D. (ur). (2006,a), *Ljudska bezbednost, Zbornik tekstova I,* Beograd, Fond za otvoreno društvo.
9. Dulić, D. (ur). (2006,b), *Ljudska bezbednost, Zbornik tekstova II,* Beograd, Fond za otvoreno društvo.
10. Galtung, J. (1990), „Cultural Violence", *Journal of Peace Research*, London, SAGE Publications, Ltd., Vol. 27, No. 3, (291-305).
11. Hyde-Price, A. (2001), „Security Studies in the Twenty-First Century", in: Gartner, H., Hyde-Price, A., Reiter, E. (eds), *Europe's New Security Challenges*, London, Lynne Reinner Publishers, Boulder, (27-54).
12. Katić, Lj. (2011), *Savremeni koncept nacionalne bezbednosti i profesionalno pripremanje kadrova,* neobjavljena doktorska disertacija, Beograd, Univerzitet u Beogradu – Fakultet bezbednosti.
13. Kaufman, S. Dž. (2012), „Etnički sukob", u: Vilijams, P. D. (priredio), *Uvod u studije bezbednosti,* Beograd, Službeni glasnik, Univerzitet u Beogradu – Fakultet bezbednosti, (271-290).
14. Kerr, P. (2006), „Razvoj dijalektičkog odnosa između državocentrične i ljudskocentrične bezbednosti", *Ljudska bezbednost, Zbornik tekstova II*, Beograd, Fond za otvoreno društvo, (21-51).
15. Kulić, R. (1997), *Sadržaj rada i obrazovanje*, Beograd, Institut za pedagogiju i andragogiju Filozofskog fakulteta Univerziteta u Beogradu.
16. McCawley, P. F. (2009), *Methods for Conducting an Educational Needs Assessment,* Moscow, Idaho, U.S, University of Idaho.
17. Nussbaum, M. C. (2010), *Not for Profit. Why Democracy Needs the Humanities*, Princeton, Princeton University Press.
18. Pastuović, N. (1978), *Obrazovni ciklus*, Zagreb, Andragoški centar.
19. Rajt, R. (2007), *Kratka istorija progresa,* Beograd, Geopoetika.
20. Rosenau, J. N. (1998), „The Dinamism of a Turbulent World", in: Klare. M. T., Chandrani, Y. (eds), *World Security – Challenges for a New Century*, New York, St. Martins Press, (18-35).
21. Savićević, D. (1989), *Koncepcija obrazovnih potreba u andragogiji*, Beograd, Zavod za udžbenike i nastavna sredstva, Institut za pedagoška istraživanja, Katedra za andragogiju Filozofskog fakulteta.
22. Simić, D. (2002), *Nauka o bezbednosti, Savremeni pristupi bezbednosti*, Beograd, JP Službeni list SRJ.
23. Šušnjić, Đ. (1999), *Metodologija*, Beograd, Čigoja štampa.
24. UNDP, (1994), Human Development Report, New York – Oxsford, Oxsford University Press.
25. Vilijams, P. D. (2012), „Uvod u studije bezbednosti", u: Vilijams, P. D. (priredio), *Uvod u studije bezbednosti,* Beograd, Službeni glasnik, Univerzitet u Beogradu – Fakultet bezbednosti, (39-54).
26. Vitvort, S. (2012), „Feministička stanovišta", u: Vilijams, P. D. (priredio), *Uvod u studije bezbednosti,* Beograd, Službeni glasnik, Univerzitet u Beogradu – Fakultet bezbednosti, (161-175).
27. Volc, K. (2008), *Teorija međunarodne politike*, Beograd, Centar za civilno-vojne odnose, Alexandrija Press.

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SECURITY AND ITS IMPACT ON THE DEVELOPMENT OF TOURISM IN THE REPUBLIC OF SERBIA

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Abstract: Almost all countries of the modern world support the development of tourism as an important export industry, and see it as a source of income and the opportunity to increase employment. In order to attract foreign visitors, in the global competition among a large number of destinations in the world, countries must develop their comparative advantages. In this context, it is of particular importance to identify and develop an adequate safe environment, both in terms of security of individuals, as well as the safety of the funds being invested in the tourism industry. Despite the fact that the Republic of Serbia has a diversity of tourist attractions, its tourism products have not yet been adequately developed and commercialized at the international market. Therefore, Serbia sees its chance, due to limited financial resources, in foreign direct investments (FDI) and public-private partnerships in general, as well as in the field of tourism. The level of foreign investment security and safety of tourists and locals in the tourist destinations is increasingly recognized as one of the key prerequisites of success in this field. In the text that follows, these issues will be considered in detail.

Keywords: security, development, tourism, Serbia.

INTRODUCTION

For the development of the Serbian economy, including tourism, in the conditions of limited resources, it is necessary to attract foreign investments.

When making a decision about investing in a country, besides a number of macroeconomic factors, investors also take into account safety of their investments. For foreign investors and the safety of their investment, harmonization of legislation with the rules and principles of the World Trade Organization (hereinafter WTO) and the regulations of the European Union (hereinafter EU) is of great importance and Serbia worked on it intensively in the past, during the negotiations for membership in the WTO and within the measures aimed at joining the European integration processes. As a result of these efforts, of particular importance is the adoption of the Law on Public-Private Partnerships and Concessions (Official Gazette of RS, No. 88/2011). Finally, as a factor of safety of investments, we will mention a number of bilateral agreements on mutual encouragement and protection of investments that Serbia has signed with other countries.

In tourism, as a specific sector, the safety of tourists in the destinations they visit is very important. When deciding whether to visit a destination, following a number of security risks occured in the last decade (natural disasters - the tsunami in Asia 2004, Hurricane Katrina in New Orleans and Wilma in Mexico in 2005, the earthquake in Haiti in 2010; health crisis – foot-and-mouth disease in England in 2001, SARS in Asia in 2003; terrorism - terrorist attack in the United States in 2001, the terrorist attack in Jordan in 2005; organized crime, regional instability, etc.) tourists - almost without exception - put the safety of destination in the first place, only to be followed by its attractiveness, accommodation, tourist services, arrangement prices, etc.

In this paper, we will try to point to the interconnectivity of tourists' safety factors and investment security factors and their importance for attracting foreign investments into the tourism sector in Serbia, for the purpose of its development and better positioning in the international tourism market.

NOTION AND CONCEPTS OF SECURITY

Security is a notion with multiple meanings. It is commonly interpreted based on the assumption that this notion implies a certain state, organization, function, or system, or all of these together.[1] In our country, there is no uniform understanding of the notion of security. The largest number of local authors do not mention semantic issues in its understanding, or approach them quite lightly and almost schematically. When defining the content of the concept of security, some authors start from the Latin phrase *securitas* as initial, and then move on to expressions used to denote security in some of the most widely spoken world languages - English, French, German and Russian.[2] Arguing that the concepts of security are theoretical and practical constructions of protection and improvement of reference values and interests of certain categories of objects of security, it has been emphasized that security is also a dynamic phenomenon, and in this context, both values that are being protected and the ways and means for their protection are changing.[3]

David A. Baldwin states that there are seven questions that should be answered in order to define conceptual determination of the notion of security:

- who is the security intended for – this question relates to reference objects of protection (individual, society, state, etc.);
- security for which values – values that we want to protect can be different (personal safety, political independence, democracy, free trade, etc.);
- how much security – one should strive only to achieve a specific level of security;
- security against what threats – threats by people, natural disasters, indirect or direct threats, military, or non-military, short-term, long-term (security may be threatened by actors or processes);
- what means are used to provide security – military, dipmlomatic, economic, intelligence, police, etc.;
- security at what cost; and
- security in what period of time.[4]

SECURITY CHALLENGES, RISKS AND THREATS IN TOURISM

It has already been mentioned that security represents dynamic phenomenon, so that today, besides traditional risks in tourism, one may also speak about regional instability, terrorism, organized crime, illigal migrations, and other similar challenges that majority of democratic states face today.

Security problems in tourism are conditioned by circumstances in which the tourist activity takes place, characteristics of all stakeholders in the tourism sector, their mutual relations, as well as the actions of individuals and organizations against the misuse of tourists in order to obtain unlawful benefits (by exploiting conditions in which tourist activity takes place).

As the most common security problems that tourists - and thus tourism as an activity - might encounter, the following can be identified: traffic crashes, accidents, fires, earthquakes, various technological and environmental accidents, various breakdowns, delays, water and power outages, electric shocks, conflicts, harassment, deseases, injuries, heat and cold waves, snake and spider bites, thefts, robberies, frauds, disappearances, abductions and killings of tourists.

These problems mainly occur due to:

- entering a new situation in which there is no security system common in everyday life, as well as inability to react to the new, unknown security state at certain time – not knowing the language, customs, food, etc.;
- transition from regular state into the state of a "tourist" (it is characteristic of a tourist to seek relaxation from everyday routine, leisure, recreation, entertainment, exploration of the unknown or dangerous, etc.), which lowers the level of personal ability to predict potential risks, identify hazards and undertake selfprotection;

1 Milosavljević, B., *Teorijske osnove bezbednosne procene*, Vojno delo, leto/2012, p. 140.
2 See more in: Ilić, P., *Semantičko – leksikografski aspekti pojma bezbednosti,* Vojno delo, jesen/2011, pp. 85-99
3 See more in: Mijalković, S., *Nacionalna bezbednost,* Kriminalističko-policijska akademija, Beograd, 2009, pp. 53-67
4 Baldwin, D.A., *The Concept of Security, Review of International Studies,* No 23, British International Studies Association, 1997, pp. 12-17.

- cultural differencies which cause misinterpretations of behavior and good intentions of people in a new environment;
- desire and understanding of individuals that being a tourist implies the right to misconduct (English hooligans and even tourists) and entering the zone of exploration of dangers (e.g. entering tiger reserves, lion reserves, without a guide);
- understanding how tourists are easy targets for fraud, theft or robbery, and there are always criminals and organizations which plan their criminal activity targeting tourists;
- unprofessional behavior of individuals in tourist industry, who deny the tourists basic consumer rights;
- increased the risk of occurance and tragic consequences of natural and technological hazards and disasters as a result of the large number of people in a small space, without proper knowledge of protection procedures in an emergency.[5]

In order to solve and overcome the above-mentioned problems, the Assembly of the World Tourism Organization (WTO) adopted *the Tourist Safety and Security: Practical Measures for Destinations*, and called on all states that have tourist activity to impement them, in accordance with their own law and practice. Recommended measures include three elements: *preventive safety measures, assisting tourists and international cooperation in tourism*. At the same time, the WTO distinguishes four basic sources of risk*:*

1) human and institutional environment outside the tourism sector – risks related to criminal and other negative social phenomena (theft, pickpocketing, frauds, human trafficking, terrorism, wars, inner and cross-border conflicts, political and economic instability);

2) the tourism sector and related commercial sectors – risks derive from non-compliance with contracts, frauds in commercial operations, personnel strikes, lack of fire protection, lack of preventive measures in hotels (surveillance, code key, etc.);

3) the individual travellers (personal risks) – tourists may endanger their personal safety, as well as safety of their host, engaging in adventure tourism (extreme sports, etc.), by violting laws, casuing conflicts with the locals, losing personal documents, health issues, etc.;

4) physical risks from environment (natural, climatological, epidemiological) – they largely relate to personal risk; however, unlike in the case of personal risks, there is no intent (problems occur due to ignorance or passive approach to potential risks).[6]

SECURITY OF INVESTMENTS

Presenting the impacts that the security situation has on tourism development necessarily involves pointing to the importance of investments for its development. Specifically, when making a decision about investing in a country, that is, in certain segments of its economy, including the tourism sector, investors take into account safety of their investments, besides a number of other, macroeconomic factors. Therefore, the focus of their interest is both on international treaties and regulations of international organizations and on bilateral and multilateral agreements signed by the country in which they want to invest. The basic legal framework for the progressive liberalization of international trade in services, including tourism, is the *General Agreement on Trade in Services* (GATS), adopted during the Uruguay round of negotiations (1986-1993), as the first and only multilateral agreement that covers the area of international trade in services, including tourism.

The goal of the GATS is to establish a set of multilateral rules in international trade in services, deregulate international market of services, and ensure the growth and development thereof, while at the same time granting greater rights to companies that provide services when entering other markets. By signing GATS, foreign investors are guaranteed that terms of trade and investment will not change to the detriment of their interests, which provides them with the necessary security, while, on the other hand, their investment in key sectors can improve the technical infrastructure and business environment and increase economic competitiveness. It is believed that the GATS is the most complicated WTO agreement.

5 Živković, R., *Ponašanje i zaštita potrošača u turizmu*, Univerzitet Singidunum, 2009, p.182.
6 World Tourism Organization, *Tourist Safety and Security: Practical Measures for Destinations*, World Tourism Organization, 1996, pp. 15-17.

The signatories to the Agreement provide security to investors implementing its basic principles into national legislation. The basic principles of this Agreement are: the principle of the most favoured nation - MFN, market access, national treatment and the principle of transparency.

The Agreement recognizes four modes of service delivery: cross-border provision of services, cross-border supply of services, consumption abroad, commercial presence and movement of natural persons. For foreign investors, the third mode of providing services, that is, "commercial presence" in services, including tourism is of particular importance. By defining this way of providing services, investors receive a guarantee that conditions will not change and thus they gain investment security. This model of service delivery in tourism is manifested in opening hotels, restaurants, travel agencies, foreign service providers, etc.

From the standpoint of business under contractual arrangements, particularly those present in the hospitality industry, of equal importance is the fourth mode of providing services - "movement of natural persons". The GATS provides a framework for the negotiation over temporary entries and stays of personnel from service industries in another country. Successful provision of tourist services largely depends on the applied knowledge, expertise and technical skills, of both the owners of companies and employees. The possibility for a company to transfer key personnel, such as travel agencies' managers or technical experts in hotels, restaurant chefs or tour guides in foreign markets in order to ensure the provision of services, is the basic component of business strategy for all types of tourism businesses related to international business operations. The Agreement does not limit the immigration laws, nor does it prevent authorities from applying restrictions on the free movement of labor across borders (managers, restaurant chefs, tour guides in foreign markets, and the like).

One of Serbia's strategic goals is its membership in the WTO. In the process of Serbia's accession to the WTO, from 2005, when the first round of negotiations was held, until April 2012, a total of 12 rounds were held. So far, Serbia has made significant steps, and full membership is expected in the near future. Serbia has done much to harmonize regulations with the WTO rules and principles, which represents the essence of the accession process. With its reception in the membership of the WTO, Serbia will send a positive signal to foreign investors on the stability and predictability of its economic system.

Strong momentum for investors, which instils confidence in legal certainty and enables necessary predictability of business operations, both in the economy and in the tourism sector, was the fact that Serbia was granted the EU candidate status in March 2012. With the EU integration process, Serbia started harmonization with EU legislation, which represents a strong impulse to the investors, both in the economy and in the tourism sector. The reform and efficiency of the judiciary, that is, the achievement of European standards in this area, is one of the basic conditions for membership. In this way, Serbia, with the process of European integration, enhances legal certainty and enables predictability of bisiness operations necessary for foreign investors. Positive experiences of new member states confirm this.

With refrence to the above said, one should bear in mind that the existence and the trend of increase in foreign direct investment also creates the possibility of international disputes. From the standpoint of foreign investments safety, of particular interest are Serbia's bilateral agreements on mutual encouragement and protection of investments. They represent necessary conditions for attracting foreign investors, because they guarantee compliance with international standards for the protection of their rights in this area. Serbia, as the legal successor of the Federal Republic of Yugoslavia and the State Union of Serbia and Montenegro, has 26 bilateral agreements of this kind in force. These agreements provide national treatment to foreign investors, as well as the most favored nation treatment. This Agreement (GATS) also protects investors from expropriation, and guarantees them compensation in the case of the so-called non-commercial risks and, as one of the most important aspects, the establishment of international legal protection in the case of a dispute between a foreign investor and the state. This is one of the basic rules laid down by the Convention on the Settlement of Investment Disputes between States and Nationals of Other States, written under the auspices of the International Bank for Reconstruction and Development (Washington, 1965), which Serbia (and Montenegro) ratified in 2006 (the Official Gazette of Serbia and Montenegro -

International Treaties, No 2/06). Specifically, the former SFRY was a signatory of the Convention on the Settlement of Investment Disputes between States and Nationals of Other States. It was ratified in 1966, and entered into force in 1967. After the dissolution of Yugoslavia, the Federal Republic of Yugoslavia also ratified it in 2002, and then Serbia and Montenegro in 2006. Upon withdrawal of Montenegro, Serbia has become the successor to the Convention.

The adoption of the provisions of the Convention, its ratification and implementation into national law allow Serbia to send a signal to foreign investors, not only as a country open to foreign investment, but also as a country that provides maximum protection to foreign investors. Since 2002, in accordance with the recommendations of the member states of the Organisation for Economic Co-operation and Development - OECD, these agreements have also included provisions on respect for internationally established standards in the field of environmental protection, fight against terrorism, as well as compliance with minimum working conditions laid down by the International Labour Organization.

In the indirect relation to investments safety and attracting foreign investors, we will mention the interest of foreign investors in the tax policy related to their investments, keeping in mind that profits from such investments are subject to double taxation. Such agreements, as in any other country, are an important element of economic and fiscal policy of each country. The Republic of Serbia has signed fifty agreements to avoid double taxation.

When discussing requirements for the development of tourism in Serbia, a national legislative framework must be inevitably emphasized, which, among other things, provides security to investors and encourages investment. Of special significance are also the Foreign Investment Law (Official Gazette of the FRY, no. 3/2002 and 5/2003 and Official Gazette of the FRY, no. 1/2003 - Constitutional Charter), the Law on Companies (Official Gazette of RS, no. 36/2011 and 99/2011), the Law on Foreign Trade (Official Gazette of RS, no. 36/2009), the Customs Law (Official Gazette of RS, no. 18/2010 and 111/2012), the Law on Regional Development of Serbia (Official Gazette of RS, no. 51/2009 and 30/2010), the Law on Local Self-Government (Official Gazette of RS, no. 129/2007), the Law on Public Property (Official Gazette of RS, no. 72 / 2011), the Law on Public-Private Partnership and Concessions (Official Gazette of RS, no. 88/2011), the Law on Tourism (Official Gazette of RS, no. 36/2009, 88/2010, 99/2011 - second law and 93/2012), as well as a set of laws in the field of environmental protection. Unfortunately, the passing of these laws was not accompanied by simultaneous preparation and adoption of by-laws, so that the efficiency of their implementation was significantly reduced.

Thus, for example, with the passing of the Law on Concessions, the first step was made towards establishing the basic principles for concession contracts in almost all sectors. Furthermore, with the adoption of the Law on Public-Private Partnerships and Concessions, Serbia was given the opportunity to, like many other states, ensure funding through this form of investment, and enable the development of the economy as a whole, including tourism. With these laws, Serbia has moved in the direction of harmonizing rules in the field of public procurement and concessions in relation to the legal framework of the Member States of the European Union, with the aim of enabling the funding and implementation of public-private partnership with or without elements of concession in a transparent and efficient manner, and substituting traditional state funding of infrastructure projects, wherever possible, with project funding based on the principle of public-private partnerships.

Creation of conditions for development, in accordance with the adopted strategic documents, includes the implementation of adopted laws and regulations, as well as creating new ones, with the aim of providing the legislative and institutional security, to both domestic and foreign investors, and tourists and citizens.

LEVEL OF DEVELOPMENT OF TOURISM IN SERBIA

The tourism industry in the world has become a significant generator of economic and social development. International tourism revenues reached 1,030 billion USD (740 billion €) in 2011, compared to 927 billion $ (699 billion €) in 2010.[7] Export revenues which tourism now generates

7 World Tourism Organization , *UNWTO, Tourism Highlights, 2012 Edition*, p. 5

account for 30% of the worldwide export of services sector and 6% of total exports of goods and services.[8] Therefore, it is not surprising that there are more and more governments in the world, which see tourism development as a stable economic and social development. Contemporary tourism is the most important export "product" for more than one third of the developing countries, while for some undeveloped countries it is the main source of foreign currency revenues.

In the last decades of the 20th century, in conditions of a number of security challenges and isolated economy, the economic life of Serbia was marked by a drastic decline in economic activity. The tourism industry was not able to timely adapt its offer to the requirements of the international tourism market and was mostly out of international competition. A new phase in social and economic development of Serbia began in 2000, with the process of lifting of economic and political sanctions, and its integration into the world economic flows. The environment has changed and more favorable conditions for tourism development and introduction of Serbian tourism products in the international tourist market have been created. However, in order to attract interest, in the conditions of very strong competition among many destinations, Serbia needs to build a competitive tourism product and meet the high standards that tourists today demand in terms of comfort and service quality. By definition, this means adequate tourist offers, but also an adequate security environment.

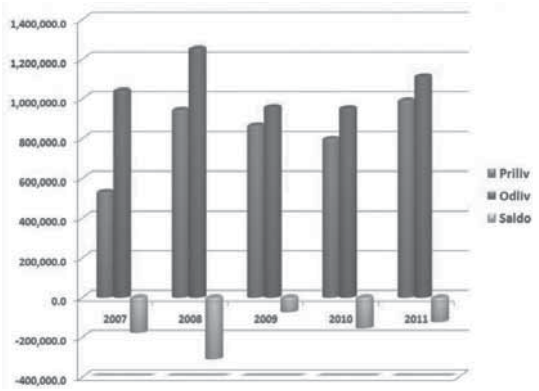

Figure No. 1: *Foreign exchange inflow and outflow of tourism 2007-2011 (in millions $)*[9]

Although it is still very modest compared to the developed and traditionally receptive and eminent tourist markets in the world, during the last decade, foreign exchange income from tourism in Serbia greatly increased, compared with the last decade of the 20th century. In 2008, income from tourism reached $944 251 million, and was the highest recorded income from tourism since 2000. However, during 2009, the effects of the global crisis have not outflanked tourist sector in Serbia, when the foreign exchange income declined by 8.35% compared to the previous year. This trend continued in 2010 and stopped at a level, which, when comapred to the record in 2008, was lower by 15.45%. Just like the rest of the world, signs of recovery of the tourism sector emerged in Serbia in 2011, and the foreign exchange inflow exceeded the 2008 record, reaching $991,660 million.

Despite the relatively stable growth in foreign exchange inflow from tourism, there is a continuous deficit. The largest deficit in this period was recorded in 2008 (-309 432 million $). In 2009, the deficit decreased to -72 443, and in 2010 it increased to -154 205 million $. It is interesting that in 2011 the deficit (- 121,918 million $) decreased compared to the previous year (- 154,205 million $), although in 2011 the highest income from tourism was recorded, which was the result of the economic situation in the country and the decline in living standards (data on inflow and outflow are shown in Figure 1). At the same time, omnipresent small share of investments in tourism has also been present in Serbia in recent years. According to the data of the National Bank of Serbia, their participation in the period 2004-2010 in the country's total investment was about 0.5%.[10]

8 *Ibid*, p. 3.

9 Source: Narodna Banka Srbije, Sektor za ekonomske analize i istraživanja, Odelenje statistike platnog bilansa (http://www.nbs.rs/internet/cirilica/80/platni_bilans.html).

10 Samardžić S.,Gavrilović-Gagović S., *Tendencije uslužnog privrede sektora Srbije*, Tržište, novac, kapital, br.2, 2011, pp 36, 37.

HUMAN RESOURCES

Viewed through the prism of security, tourism, as a labor-intensive sector with its supporting activities, is a major generator of providing social security through the provision of significant employment opportunities for unskilled and semi-skilled labor force, especially women and young population. From a global standpoint, the female population accounts for 70% of total employment in the tourism and related industries in the sector, and half of the employees are under the age of 25. It is expected that by 2020, the tourism with activities that support this sector, will create additional 60 million jobs.[11]

Tourism provided more than 235 million jobs in 2010 (about 8% of total world employment).[12] According to estimates of the International Labour Organization - ILO, unemployment fueled by the global crisis has affected 11 to 17 million workers in developed countries and 19 to 42 million workers in developing countries.[13] It has already been said that the tourism sector could be an important source of employment for those labor forces which lost their jobs. In this regard, it should be noted that in Serbia, this labor-intensive sector employs 5-6% of the active population, whereas globally observed, one out of twelve businesses is related to tourism. It is obvious that the comparative advantages that imply not only abundace of interesting tourist locations, but also a considerable level of security, are still not exploited to their full extent. In the conditions of continuing unemployment problem and many others that inevitably accompany it, the question of the development of tourism increasingly gains in importance (economic, social and political).[14] Unemployment is one of the most serious social and even security-related problems that Serbia faces. According to the Labour Force Survey, which was conducted in October 2012, the unemployment rate in Serbia is 22.4%.[15]

Since the development of the economy and employment have always been in the centre of focus of both society as a whole and of each individual, successes and problems in these areas have given basic characteristic to the social development of the country in a given period. Decrease in number of employed working-age population in a society can cause a number of effects that directly affect economic growth, poverty rate, social differences, illegal labor (comprising about 30% of gross domestic product[16]), but also the level of security of people and capital. These are very important reasons that call for making a much better use of the opportunities provided by the current security situation and the effects of tourism development in Serbia. This is due to the fact that tourism, as a labor-intensive tertiary activity and a very important part of the Serbian economy, is also an industry that gives the opportunity for the development of the whole community. Placed in the broader concept, tourism can affect the resolution of the problem of unemployment, not only by the direct mobilization of a large number of manpower in the field of tourism, but also indirectly supporting employment in other industries. Although Serbia as a tourist destination has its comparative advantages, and although one of its most important resources are human resources, we must not lose sight of the need to transform its comparative advantages into its competitive advantage.

Coordination of the state is of vital importance for achieving a functional network of interested parties in tourism development, which means that the state is to have access to and influence on the development of all key segments of the development in a planned and systematic manner, in accordance with the adopted strategic documents. In order to achieve the defined strategic goals, there needs to be planning, directing, training, incentives, assessment of the level of achieved goals and monitoring in all relevant segments, including security.

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11 UNCTAD, TD/B/C.I/8, *The contribution of tourism to trade and development*, Geneve, 2010, p. 6.
12 http://www.ilo.org/global/about-the-ilo/media-centre/press-releases/WCMS_146761/lang--en/index.htm, accessed on 15/01/2012.
13 UNCTAD, TD/B/C.I/8, *The contribution of tourism to trade and development*, Geneve, 2010, p. 6.
14 Ministarstvo trgovine, turizma i usluga, *Strategija razvoja turizma Republike Srbije, skraćena verzija*, Beograd, 2006, p.1.
15 http://webrzs.stat.gov.rs/WebSite/public/PublicationView.aspx?pKey=41&pLevel=1&pubType=2&pubKey=1517, accessed on 27.12.2012.
16 Bošnjak M., Ministarstvo finansija, Socioekonomski i strukturni napredak Srbije u tranzicionom periodu 2001-2007. godina, Ministarstvo finansija, 2008, p. 32.

CONCLUSION

There is no doubt that every state that seeks to, by attracting investments in tourism, develop this sector and position itself in the demanding international market, along with the creation of a positive and safe investment environment, must ensure the safety of tourists who visit it. Only in this way the host country will meet the requirements that foreign investors expect when investing. Unlike other industries, for profitable business in the tourism industry, it is necessary that final customer or user of a tourist service visits destination. Without destination's security, regardless of accommodation quality, tourist facilities, skilled labor force, courtesy of employees, accessibility of destination, good marketing, and other factors important when choosing a tourist destination, tourists will not come. Without tourist traffic, there are no revenues for investors or for the host country, and thus no foreign investment or employment in this labor-intensive sector. The above said applies to all countries of the modern world, including the Republic of Serbia. The current situation offers great opportunities, but also obliges.

REFERENCES

1. Baldwin, D.A., *The Concept of Security, Review of International Studies, No 23*, British International Studies Association, 1997.
2. Bošnjak M., *Socioekonomski i strukturni napredak Srbije u tranzicionom periodu 2001-2007.godina*, Ministarstvo finansija, 2008.
3. Ilić, P., *Semantičko – leksikografski aspekti pojma bezbednosti,* Vojno delo, jesen/2011, Ministarstvo odbrane Republike Srbije, Beograd, 2011, pp. 85-99
4. Milosavljević, B., *Teorijske osnove bezbednosne procene*, Vojno delo, leto/2012, Ministarstvo odbrane Republike Srbije, Beograd, 2012, p. 139-149.
5. Mijalković S., *Nacionalna Bezbednost*, Kriminalističko-policijska akademija, Beograd, 2009.
6. Samardžić S.,Gavrilović-Gagović S., *Tendencije uslužnog privrede sektora Srbije*, Tržište, novac, kapital, br.2, 2011, pp. 29-39
7. Živković, R.: *Ponašanje i zaštita potrošača u turizmu*, Univerzitet Singidunum, Beograd, 2009.
8. European Commision, *Europe in figures – Eurostat yearbook 2011*, Luxembourg, 2012.
9. Ministarstvo trgovine, turizma i usluga, *Strategija razvoja turizma Republike Srbije, skraćena verzija*, Beograd, 2006
10. Republički zavod za statistiku Srbije, *Anekta o radnoj snazi 2011*, Beograd, 2012
11. UNCTAD, TD/B/C.I/8, *The contribution of tourism to trade and development*, Geneve, 2010.
12. World Tourism Organization, *Tourist Safety and Security: Practical Measures for Destinations*, World Tourism Organization, 1996.
13. World Tourism Organization , *UNWTO, Tourism Highlights*, 2012 Edition.
14. http://www.nbs.rs/internet/cirilica/80/platni_bilans.html.
15. http://www.ilo.org/global/about-the-ilo/media-centre/press-releases/WCMS_146761/lang--en/index.htm.
16. http://webrzs.stat.gov.rs/WebSite/public/PublicationView.aspx?pKey=41&pLevel=1&pubType=2&pubKey=1517.

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SCOPE, DYNAMICS AND STRUCTURE OF ECOLOGICAL CRIMES IN SERBIA[1]

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Abstract: The explosion of ecological crime globally has catastrophic consequences that precisely this type of crime leaves behind, without exaggeration, hitting the foundations of modern civilization. There are a wide variety of forms of environmental crime, environmental friendly with a negative impact on human health. The main purpose of this paper is to emphasize the need for increased focus on preventing and combating environmental crime, the members of all bodies and institutions involved in the fight against this form of crime. In the first part of the paper the concept and main features of ecological crimes are presented. The next part of the paper deals with the criminal aspect of the legal environment in Serbia. While in the third part, the quantitative indicators, analyzes the status and trends of environmental crime in Serbia.

Keywords: environmental crime, consequences, environment, quantitative results.

INTRODUCTION

Range of environmental pollution is from the newest forms even within the limits of tolerance, and to the worst forms of pollution expressed to a greater extent, and where the consequences are manifested in the form of environmental offenses. Environmental crimes and other forms of crime, threaten certain social goods and values, namely the environment, with negative impacts on human health.[5] Therefore, the need to take legal action in this area is based primarily on the need to combat serious pollution cases of expansion or endanger the environment. Ecological crime is a serious international problem, which manifests itself in various forms and are not limited to air, water and soil or the extinction of plant and animal species to extinction, but applies to actions accelerating climate change, a drastic reduction of fish stock, devastation of forests and the like - even the destruction of natural resources.[6] While traditional crime poses a threat to social stability, environmental offenses threatening the survival of human society.[7]

Threats to environmental crime are a growing problem that causes serious damage to the environment. In recent years, a number of actions that threatens have been multiplied. In addition, this type of crime is susceptible to the perpetrators of the possibilities of realizing large profits with minimal risk of detection and prosecution, especially when it comes to criminal offenses with elements of organized crime with international stature. For these reasons, the criminal law protection of the environment has expanded greatly.

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5 Boskovic, M. (1993) *Methods - detecting and solving environmental crime*, Police College, Belgrade, p.1-24.
6 Pisarić, M. (2011) *Suppression of cross-border environmental crime*, Journal of Law, University of Novi Sad, 2/2011, Novi Sad, p.425-439.
7 Lukic, T., (2011) *Legal protection of the environment*, Proceedings of the Faculty of Law in Novi Sad, 2/2011, Novi Sad., p.237-247.

In Serbia, the environment is protected value in the first place by the Constitution and the Penal Code. In addition to the direct criminal-legal protection, the environment is protected and indirectly by a number of laws and regulations in other areas, which provide appropriate sanctions for violations of specific human-environmental values.[8] The European Union has put in effect more than 200 regulations and directives that are explicitly linked to the natural environment, and are related to air and water pollution, waste management, biotechnology, Nature Conservation and Nuclear Safety.

Other issues that are regulated by EU regulations include access to information in the field of environmental protection and liability for environmental damage, and for the purpose of improving environmental protection established by the European Environment Agency, based in Copenhagen.[9] In addition to the general characteristics, environmental crime is characterized by the special characteristics of which some will be analyzed in this paper: - quantitative characteristics (volume), its relative share in the total mass of crime, its dynamics, and - the structure of ecological crimes or types of crimes ga make, participate in such crimes overall environmental crime and its dynamics.

ECOLOGICAL CRIME FIRST-TERM AND CHARACTERISTICS

Ecology and criminality are the relevant social facts which synthesis is a new concept - environmental crime. Ecological criminality is a contemporary of crime and includes all aspects of activities aimed at threatening the environment and as such is incriminated as certain criminal offenses in the Criminal Code of the Republic of Serbia. This is the environmental group mean crime offenses that protect the environment. This type of crime is difficult to detect and has a negative impact on the living and working environment.[10]

Ecological disturbances occur when the environment starts to negatively influence the survival of species change in quality of life. It can be local or global, more or less, to last a few months or a few million years, may be caused by natural or human-induced, can lead to the loss of one or more species.

Ecological crime can be seen in the broader and narrower terms. The broader significance of environmental crime is defined in the claims that it "is any act committed with the intent to cause damage or potential damage to the environment and / or the biological world, in order to thus obtain business or personal gain."[11] The concept of ecological crime emphasizes the willful damage or damage to the environment that is conscious and volitional act that business and personal (i.e., individual interests) assumes the general public interest, which is reflected in a healthy natural environment.

Limited legal aspect of perception, environmental crime is determined as any act that is contrary to established norms and ecological legal can be processed. Essentially, this concept has been in existence legally standardized rules of conduct in the field of environmental protection, which are generally the mandatory character, pre-set and for the violence of the penalty prescribed.

Ecological crime refers to all activities in violation of environmental regulations, and which cause heavy damages or threatens the environment and human health. The most famous event of this type of crime is occurring as illegal emissions or discharges of substances into air, water or land, illegal trade in animals and plants, the illegal trade in substances that deplete the ozone layer, or hazardous waste, and the like.[12] Ecological crime brings its very high profits to perpetrators, it is difficult to detect and cause very serious negative consequences for the environment. Today it is considered a serious and widespread problem which must be fought at the European level.[13]

8 Keković, Z. and Todorovic, Z. (2008): *Threats to the environment in the Republic of Serbia - a security aspect*. NBP, Criminal Police College, No. 13 (3), Belgrade, p. 23-40.

9 Cardwell P. J., French D., Hall M. (2011). *Tackling environmental crime in the European Union: The case of the missing victim?*, The 9th International Conference on Environmental Compliance and Enforcement, 20-24 June 2011, British Columbia, Canada: The International Network for Environmental Compliance and Enforcement, p.3, (http://inece.org/conference/9/papers/French%20D_Enviro%20Crime_FINAL%20v3.pdf) dostupan 15.7.2012.

10 Blagojevic, M., et al., (2011).*The concept of sustainable development in the ecological function of crime*, Journal of Ecologica, No.63, p. 544-548.

11 Clifford. M. (2008*) Environmental crime- enforcement, policy and social responsibility*, Aspen Publishers, Gaithersburg,. p.26.

12 Kostic, M. (2009) *Ecological crime and its prevention*, legal life, no. 10, Association of Serbia, Belgrade, p.175-182.

13 Kostic, M. (2009) *Ecological crime and its prevention*, legal life, no. 10, Association of Serbia, Belgrade, p.175-182.

Therefore, this type of crime involves intentional act or omission which has led to environmental degradation and the resulting adverse effects on humans, the environment and natural resources. Criminal offenses against the environment include all violations of environmental regulations that draw criminal sanctions.

Ecological crime is a special form of crime that has resulted in pollution of water, air and land on a larger scale and in a wider area, there by endangering the life and health or cause the destruction of the flora and fauna at large extent. [14]

Ecological crime tends to intense development while becoming more and more serious forms of crime features that significantly threaten human values. Ecological crime as part of an overall modern criminality has a number of features that characterize contemporary crime governance, such as mass, dynamics, adequate level of organization, and the continued expansion of the presence of a foreign element, as well as deftly adapt to the new socio-political and economic relations.[15] A special feature of this type of crime in the aspects of Victimology, where all the victims that are denied ambiance that there is no victim.[16]

One of the important features of this type of crime is its undercover. It risking not detecting these crimes - there is that so-called dark figure of crime (number of undiscovered crimes and perpetrators and crimes which perpetrators are not prosecuted). In ecological crimes "dark figure" occupies a prominent place. Latent environmental crime occurs mainly for two reasons. First, as a number of these crimes committed by the consequences of not publicly manifested, or have not performed immediately, and the crime and its perpetrator remain unknown, and second, that regardless of the visible external manifestations of a higher level of environmental pollution certain measures haven't been taken to establish the existence of specific environmental crime and detection of the perpetrator. In both cases, such committed environmental crimes were not discovered or proven and, therefore, are not included in official statistics by the authorities. This guided statistics indicate only the number of detected and tracked ecological crimes, which can be used to express the activities of the competent authorities in detecting and proving these offenses, but not for the view of the real situation in the field of environmental crimes committed. [17]

Basic forms of threats to the environment are various forms of pollution of water, air, soil, effects ionizing radiation, noise, etc... The causes of these threats are very numerous. Water is threatened all forms of human activity, from actions of man, and the process at the global level (seas, oceans, etc.). Air is threatening especially from industry, heating, motor vehicles, nuclear power, various wastes, and hazardous substances. Land has also been processed by urbanization, industrialization, where especially h farmland, forests, and natural resources have been hurt. Forests are menaced all forms of human activity, ranging from individual destruction, cuts, to mass destruction and conversion of forests to other areas, thus reducing the volume of the source of life.[18]

Organized crime is considered as particular problem. It seeks to establish its diverse activities, maintain and expand to all those areas of social life where it can achieve an adequate benefit. Ecological crime is by its nature often transnational in character and can appear as a special type of organized crime.[19] In these cases, it manifests as a natural resource trafficking, illegal trade in plants and animals, illegal / unauthorized fishing, illegal trafficking and exploitation of minerals and precious stones, wood, or hazardous waste, etc... [20]

The transnational character of environmental crime due to either the fact that the effects of cross-border nature of crime or that there is movement of illegal goods across national borders. Such cross-border dimension of environmental crime is a result of the globalization of crime due to criminals who operate over the "disturbing porous" borders,[21] using the ease of communication and movement of goods and money.

14 Matijevic, M. (2009) *The specificity of environmental crime prevention*, Proceedings Panevoropskog University «Apeiron», Scientific Conference, «Environmental Security in the Postmodern Era,» Banja Luka, p. 1-8.
15 Boskovic, M. (1993) *Methods - detecting and solving environmental crime*, Police College, Belgrade, p. 30.
16 Ljuština A., Environmental protection through strengthening the environmental safety of the young Web site.
17 Boskovic, M. Banovic, B. (2001) *Crime methodologies*, Police College, Belgrade.
18 Matijevic, M. (2009) *The specificity of environmental crime prevention*, Proceedings Panevoropskog University «Apeiron», Scientific Conference, «Environmental Security in the Postmodern Era,» Banja Luka, p. 1-8.
19 Siegel Dina, Nelen Hans, (Eds) (2008) *Organized crime-Culture, Markets and Polices,* Springer Vol. 7, New York, p.26.
20 Kostic, M. (2009) *Ecological crime and its prevention*, legal life, no. 10, Association of Serbia, Belgrade, p.175-182.
21 Brack D. Hayman, *Intergovernmental Actions on Illegal Logging: Options for intergovernmental action to help combat illegal logging and illegal trade in timber and forest products*. UK Department for International Development, London, (http://

Forms of environmental crime can be divided into two categories:[22]

1) trade in natural resources, which includes trade in endangered species, illegal logging and the illegal exploitation and trade of mineral resources; and
2) store hazardous substances, including illegal trade of substances that deplete the ozone layer and waste management and trading.

Certain forms of environmental crime such as poaching of wild animals can threaten the existence of entire species and deprive local communities' valuable resources for tourism and the economy in general. The effects of some environmental crimes are global in nature, such as the depletion of the ozone layer, or the throwing of hazardous waste that may affect a wide geographic area, or contaminate the entire water system.[23]

Therefore, this type of crime includes offenses against the environment, making very high profits to its executors and it is difficult to detect, causing a negative impact on the environment. So, today the environmental crime has become a serious and widespread problem both at the national and international level.

CRIMINAL JUSTICE ASPECTS OF THE ENVIRONMENT IN THE REPUBLIC OF SERBIA

Ecological crime today is a real social phenomenon in which the company is forced to respond to imperative legal norms. This type of crime is not viewed nor can it be viewed in isolation from the broader crime as a social phenomenon that is criminalized and socially undesirable. Modern societies, including the Serbian society, as one of the most individual and general social values emphasize individual health and community.

The right to a healthy environment is a fundamental right of man which is in modern Law raised to the level of a constitutional right. Serbian Constitution provides that a person has the right to a healthy environment, but also established the obligation, in accordance with the law, protect and nurture the environment.[24]

Earlier, the environment is protected certain crimes, such as crimes against public health, crimes against the economy, crimes against public safety and others. In our Criminal law of January 1 in 2006 the early implementation of the new Criminal Code,[25] for the first time in one place all classified offenses which are aimed at protecting the environment and which primarily protects the environment.[26]

In addition to the gradual expansion of criminal zone, expanded the circle of persons who may be responsible for crimes against the environment, the adoption of the Law on criminal liability of legal persons, [27] and in our legal system the institute of criminal liability of legal entities is introduced which so far could only respond to economic transgressions. Also a number of criminal offenses against the environment is regulated by secondary legislation and is provided for in other laws. Crimes against the environment is not protected as it was a classic human rights such as life and health, but alone it is a good environment, more precisely, the right man in the preserved environment. [28]

As mentioned before, now all crimes are systematized into one's head (XXIV), and are named Crimes against the environment. The main object of protection of this category of criminal offenses is the environment. This essentially stems from the title of a number of offenses in this group.

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www.illegal-logging.info/pdf), 15.7.2012.

22 Pisarić, M. (2011) *Suppression of cross-border environmental crime*, Journal of Law, University of Novi Sad, 2/2011, Novi Sad,p..425-439.

23 Pisarić, M. (2011) *Suppression of cross-border environmental crime*, Journal of Law, University of Novi Sad, 2/2011, Novi Sad,p..425-439.

24 Krstic, J., (2012) *Environmental offenses - an analysis of reality in the example of the Republic of Serbia*, 10 International scientific conference with Synergy 2012, p.374-385.

25 *Criminal Code* ("Official Gazette of the Republic of Serbia", no. 85/2005, 88/2005, 107/2005, 72/2009 and 111/2009).

26 Stojanovic, M., Peric, O. (2009) *Criminal Law-part special*, Faculty of Law, University of Belgrade, p.210.

27 *The law on liability of legal persons for criminal offenses* ("Official Gazette of the Republic of Serbia", no. 97/2008).

28 Stupar, B., *Basic legal aspects of environmental protection in the Republic of Serbia* (http://www.besplatnapravnapomoc.rs), available 18/07/2012.

- Environmental pollution art. SCC 260,
- Failure to take measures to protect the environment art. SCC 261,
- Illegal construction and operation of facilities and plants that pollute the environment art. SCC 262,
- Damage to structures and devices Environmental Art. SCC 263,
- Damage to the environment art. SCC 264,
- Destruction, damage and taking abroad protected natural art. SCC 265,
- Violation of the right to information on the environmental art. SCC 268,

In other crimes that fall under the crimes against the environment in which their title without the term "environment", protecting the goods are also part of the environment such as:

- The killing and torturing animals Art. SCC 269,
- Transmission of infectious diseases in animals and plants Art. SCC 270,
- Devastation of forests art. SCC 274,
- Forest art theft. SCC 275,
- Illegal hunting of Article 276 SCC,
- Illegal fishing art. SCC 277 and others.

Common to all of these prescribed offenses is that the object of protection in these cases just the right man to the preserved environment as a basic human right guaranteed in international law.[29] Most of these crimes can be made with the intent of negligence but some of these offenses may be done only with the intent and criminal offenses referred to in Article 262, 266, 267, 268, 269, 274, 275, 276 and 277 SCC.

In all cases, for crimes against the environment, the prosecution will be done of the ex officio by the Public Prosecutor.

In addition, it is anticipated that in some cases, punish and attempts of crime against the environment regardless of the amount prescribed sanction, and it is a crime under Article 265 para. 3, Art. § 266. 1 and Art. § 275. 1 and 2.

The specificity of certain criminal acts of this group makes it different from other crimes in the criminal code that for some of these offenses criminal code expressly provides for the imposition of a suspended sentence with an obligation to the offender within a specified period to undertake certain specified safeguards, preservation and improvement of the environment and that the offenses referred to in Articles. 260, 261, 262, 263, 264 and 266 SCC.

For certain offenses it is provided that the funds for a criminal offense subject to criminal offenses and seized and these are criminal offenses under Art. SCC 276 and 277.

One of the important, the essential characteristics of crimes against the environment is that it is the primary object of protection of the environment have, or a person's right to a healthy and relatively well preserved nature and productive life in harmony with it, as one of the fundamental human rights enshrined in national and international Right. This right, unlike other human rights concerns and to future generations.[30] It is therefore of paramount importance that the environment has grown into an independent and primary object of protection,[31] considering that up to half of the twentieth century, protected only by another object of protection, such as health or general safety.[32]

In addition to a positive legal framework in the field of criminal responsibility of natural persons, which could be seen, consists of incrimination contained in Chapter XXIV of the Criminal Code, the Act on the criminal liability of legal persons,[33] in our legal system introduced the institute of criminal liability of legal entities, which are until now could only

29 Krstic, J., (2012*) Environmental offenses - an analysis of reality in the example of the Republic of Serbia*, 10 International scientific conference with Synergy 2012, p.374-385.
30 *Criminal Code* («Official Gazette of the Republic of Serbia», no. 85/2005, 88/2005, 107/2005, 72/2009 and 111/2009).
31 Stojanovic, M., Peric, O. (2009) *Criminal Law-part special*, Faculty of Law, University of Belgrade, p.210.
32 Gajinov, T., Vig, M., (2012) *The problem of environmental crime and improving the criminal justice system of environmental protection in the Republic of Serbia*, 10 International scientific conference with Synergy 2012, p.310-317.
33 *The law on liability of legal persons for criminal offenses* («Official Gazette of the Republic of Serbia», no. 97/2008).

respond to economic crimes.[34] Therefore, the adoption of the liability of legal persons for criminal offenses, constituted a positive legal framework in the field of environmental criminal liability of legal persons.

Tort actions entities have unforeseeable negative consequences in all areas. There is the greedy desire for profit, some entities out even the basic assets of individuals and society. Damage caused by criminal acts that are very high for all of society, especially when it comes to crimes against the environment.[35]

The consequence of the crimes in the field of environmental crime consists in harming or damaging the environment. As a result of injuries is to destroy or damage the environment as a result of a threat which consists in causing danger to the environment in which a distinction is made on concrete and abstract danger. In fact, this particular threat to the environment threatens to injury but there was no danger of an abstract effect, just created the possibility that the environment comes into danger, but that did not happen.

STATUS AND TRENDS OF ENVIRONMENTAL CRIME IN SERBIA

In addition to the general characteristics, environmental crime is characterized by particular characteristics. As its special characteristics, which are analysed in the present study, the following can be mentioned:

– Quantitative characteristics of ecological crimes (scope), the relative share in the total mass of crime, the dynamics
– Structure of ecological crimes or types of crimes that make it, the participation of these offenses in the overall environmental crime and their dynamics.

These characteristics will be analysed based on the available statistical data relating to the Republic of Serbia for the period 2006-2010, which, with all the limitations and drawbacks, however, represent an indispensable source of information on crime detected.

Table 1. Volume of reported crime acts of the environmental crime in the Republic of Serbia in the period 2006-2010.

Year	Total reported crime acts	Reported crime acts of the environmental crime	Index
2006	105701	2009	1,90%
2007	98702	1831	1,85%
2008	101723	1895	1,86%
2009	100026	2081	2,08%
2010	74279	1568	2,12%

Source: Statistical bulletin of the Statistical Office, 2006, 2007, 2008, 2009, 2010, Belgrade.

In regard to the scope of environmental crime on the territory of the Republic of Serbia and its relative share in the total volume of crime, Table 1 shows that the share of ecological criminal offenses in each of the observed years was about 2%. On the territory of the Republic of Serbia, in

34 Krstic, J., (2012) *Environmental offenses - an analysis of reality in the example of the Republic of Serbia*, 10 International scientific conference with Synergy 2012, p.374-385.

35 Crime entities in the professional community and the public in general terms means the crime and corporate crime "white collar". Corporate crime includes those offenses which violate the norms of the corporation which their operations are regulated. It is a form of crime that made people in important positions in organizations, institutions and corporations to achieve illegal profits for the organization, or institution. The truth of the illegality of careful planning by business people, with a view to increase profits by bypassing or in direct violation of the law. (Tanjevic, N., (2011) *Society as crime victim legal entities*, European University, Faculty of European Business and Marketing, Belgrade, Themis, June, no. 2, p.61-76).

year 2006 - 2009 were reported, in 2007 - 1831, in 2008 - 1895, in year 2009 - 2081, in 2010 - 1568 criminal acts of the ecological crime. Significant reduction in the number of reported crimes in years 2007 and 2008 is noticeable, in the relative terms and in year 2010 in absolute terms. During the reporting period, the tendency of notification of environmental crime is rather uniform, except in year 2010, but in that year the share of the total environmental crime in total crime was about 2%.

Table 2. Structure of reported crimes of environmental crime in the Republic of Serbia in the period 2006-2010.

Year	Total CA against the environment	Pollution of the environment Article 260	Failure to take measures to protect the environment Article 261	Damage to the environment Article 264	Introduction of hazardous materials to Serbia and illegal processing, disposal and storage of hazardous materials Article 266	The devastation of forests Article 274	Forest theft Article 275	Illegal hunting Article 276	Illegal fishing Article 277	Other CA
2006	2009	16	9	4	1	182	1543	134	63	58
2007	1831	19	24	7		142	1314	154	68	107
2008	1895	21	12	2		128	1374	115	112	131
2009	2081	16	8	16		157	1462	172	111	39
2010	1568	7	4	8		69	1090	99	63	218

Source: Statistical bulletin of the Statistical Office, 2006, 2007, 2008, 2009, 2010, Belgrade.

In regard to the structure of discovered and reported/filed charges for ecological crime offenses, the data in Table 2 show that the crime act "Forest theft" stipulated in Article 275 of the Criminal Code of the Republic of Serbia (hereinafter: SCC) is dominating in the structure of ecological criminal offenses in the Republic of Serbia for the period 2006-2010. This offense comprises 76% of the total number of reported ecological crime in year 2006, 73.2% in year 2007, 72.5% in year 2008, 70.25% in year 2009 and 69.5% in year 2010, or about 72.3% on average for that period.

The next criminal offense in respect to the frequency and share is "Illegal hunting" (Article 276 SCC), which makes an average of about 7.2% of the total number of reported offenses of ecological crimes in observed five-year period. About 4.4% of the total number of reported offenses of ecological crimes is criminal offense "Illegal fishing" (Article 277 SCC). The above three crimes together with the offense – "Devastation of forests" (Article 274 SCC) in the structure of discovered and reported ecological crimes make up about 91%, while other crimes together account for about 9%.

Although in recent years the environmental crime is in expansion, the percentage of filed charges for criminal offenses against the environment is negligible compared to other crimes. Presented statistics show large differences between the numbers of filed charges for criminal acts as stipulated by SCC, Chapter XXIV. The data show that the most common charges are for forest theft, illegal hunting and fishing, as well as the devastation of forests. Data of other researchers show that the illegal timber trade is one of the most present illegal activities in the field of environmental crime[36]. Considering that the wood is difficult to smuggle hidden, complex methods are used in the illicit trade, and only few organizations are able to exploit the opportunities of this illegal trade. The evidence from Indonesia shows that companies that cut were often involved in extensive illegal cutting, and senior executives in these companies were accused of organizing illegal trade. Poor regulation and the difficulty in identifying the seized wood contribute to the existence of weak evidence to show the volume/scope of trade. The relationship between the illegal trade and the threat that it poses to the endangered species is not only direct, because few species of trees are on the protected list. However, logging destroys the habitat of endangered species, and often directly protected animal species[37].

36 Cook D., Roberts M. and Lowther J. (2002). *The International Wildlife Trade and Organised Crime – A review of the evidence and the role of the UK*. Regional Research Institute, University of Wolverhampton, p. 16.
37 *Ibid,* p. 16.

Data from these tables show that the small number of crimes against the environment has been detected, although it can be assumed that the real number of committed crimes in this filed is much higher. The crimes that are not registered represent "dark figure "of ecological crime[38].

According to statistics presented it is not a realistic reflection of the actual state of committed environmental crimes, and that it can not be the basis for making an objective conclusion. But using it can track only the number of recorded crimes in the field of environmental protection.

CONCLUSION

Ecological crime as harmful effects on the environment is a part of the overall crime and one of its newer components, as a product of general social development. Turned against the values of the environment (legal provisions that criminalized harmful effects on environmental values), points out that modern society and protect the ground because of man and the survival of his species.

The consequences of this type of crime are long-term and irreversible, and the true extent of the damage is hard to measure. The issue of combating environmental crime must be viewed within the overall news protection and improvement of the environment, taking into account its sources and forms of threats that do not know any boundaries in one or more countries, as well as the emergence of new forms of social pathologies that threaten the environment and are mainly due to modern technological development of society.

Threats to environmental crime are a growing problem that causes serious damage. In recent years, a number of actions that threaten has been multiplied. In addition, this type of crime is susceptible to the perpetrators of the possibilities of realizing large profits with minimal risk of detection and prosecution, especially when it comes to criminal offenses with elements of organized crime with international stature. Statistical data on environmental crime analyzed in this paper are of limited value, but represent an irreplaceable source of information about the structure and dynamics of ecological crime in Serbia. The empirical analysis in this matter, it may serve as an illustration for an appropriate image aspect of professional practice and collaboration with academia. Statistics show that reveals a small number of environmental offenses, although it can be assumed that the dark figure in this form of criminality significant.

REFERENCES

1. Brack D. Hayman, *Intergovernmental Actions on Illegal Logging: Options for intergovernmental action to help combat illegal logging and illegal trade in timber and forest products*. UK Department for International Development, London, (http://www.illegal-logging.info/pdf)
2. Boskovic, M. (1993) *Methods - detecting and solving environmental crime*, Police College, Belgrade.
3. Boskovic, M. Banovic, B. (2001) *Crime methodologies*, Police College, Belgrade.
4. Blagojevic, M., et al., (2011).*The concept of sustainable development in the ecological function of crime*, Journal of Ecologica, No.63.
5. Gajinov, T., Vig, M., (2012) *The problem of environmental crime and improving the criminal justice system of environmental protection in the Republic of Serbia*, 10 International scientific conference with Synergy 2012
6. *The law on liability of legal persons for criminal offenses* («Official Gazette of the Republic of Serbia», no. 97/2008).
7. Keković, Z. and Todorovic, Z. (2008): *Threats to the environment in the Republic of Serbia - a security aspect*. NBP, Criminal Police College, No. 13 (3), Belgrade, p. 23-40.
8. Kostic, M. (2009) *Ecological crime and its prevention*, legal life, no. 10, Association of Serbia, Belgrade.
9. *Criminal Code* («Official Gazette of the Republic of Serbia», no. 85/2005, 88/2005, 107/2005, 72/2009 and 111/2009).

38 Boskovic, M. (1993) *Methods - detecting and solving environmental crime*, Police College, Belgrade, p.31.

10. Krstic, J., (2012) *Environmental offenses - an analysis of reality in the example of the Republic of Serbia*, 10 International scientific conferences with Synergy 2012.
11. Lukic, T., (2011) *Legal protection of the environment*, Proceedings of the Faculty of Law in Novi Sad, 2/2011, Novi Sad.
12. Ljuština A.*, Environmental protection through strengthening the environmental safety of the young* Web site.
13. Matijevic, M. (2009) *The specificity of environmental crime prevention*, Proceedings Panevoropskog University "Apeiron", Scientific Conference, "Environmental Security in the Postmodern Era," Banja Luka.
14. Pisarić, M. (2011) *Suppression of cross-border environmental crime*, Journal of Law, University of Novi Sad, 2/2011, Novi Sad.
15. *Statistical bulletin of the Statistical Office, 2006, 2007, 2008, 2009, 2010, Belgrade.*
16. Stojanovic, M., Peric, O. (2009) *Criminal Law-part special*, Faculty of Law, University of Belgrade.
17. Siegel Dina, Nelen Hans, (Eds) (2008) *Organized crime-Culture*, *Markets and Polices,* Springer Vol. 7, New York.
18. Stupar, B., *Basic legal aspects of environmental protection in the Republic of Serbia* (http://www.besplatnapravnapomoc.rs).
19. Tanjevic, N., (2011) *Society as crime victim legal entities*, European University, Faculty of European Business and Marketing, Belgrade, Themis, June, no. 2.
20. Cardwell P. J., French D., Hall M. (2011). *Tackling environmental crime in the European Union*: The case of the missing victim?**, T**he 9th International Conference on Environmental Compliance and Enforcement, 20-24 June 2011, British Columbia, Canada: **The International Network for Environmental Compliance and Enforcement** (http://inece.org/conference/9/papers/French%20D_Enviro%20Crime_FINAL20v3.pdf)
21. Cook D., Roberts M., Lowther J. (2002). *The International Wildlife Trade and Organised Crime – A review of the evidence and the role of the UK*. Regional Research Institute, University of Wolverhampton.
22. Clifford., M. (2008) *Environmental crime- enforcement, policy and social responsibility*, Aspen Publishers, Gaithersburg.

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THEORETICAL DETERMINATION OF THE REPUBLIC OF SERBIA ENERGY SECURITY

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Abstract: The paper presents the common ground of security and energetic in the modern world. A part of available definitions along with the criticism of this concept has also been given. Based on the existing definitions, an overall of the energy security of Serbia has been derived.

Keywords: energy security, energy, oil, gas, electric energy.

INTRODUCTION

Though the significance of energy could have been anticipated even during the First World War, the nowadays attitude was only adopted after the oil "shocks" of the 80s. Since then, the importance of energy is constantly growing. Some of the authors concur that it is a new concept that aims at highlighting the growing importance of energy. In explaining this concept, as well as the majority of other social phenomena, a number of problems related to defining and limiting the field of interest appeared. The first two sections of the paper offer an introduction into the problem, first through delimiter between the field of energetic and security related to energy, and then giving a review of the historical development of the importance of energy, primarily fossil fuel in the world. The third part presents the definition by authors who have studied this, and then the criticism of the given concept. The final section contains energy security definitions applicable to the Republic of Serbia.

"ENERGY"-ENERGETICS OR SECURITY QUESTION

Multidisciplinary aspect of energetics enables varied approaches to scientists and experts of numerous profiles[1]. Therefore, some of the topics dealing with energy have been recognized by the security sector as security issues. Unlike the energy experts, the experts from the security area consider exclusively the types of energy affecting security. According to Simurdić[2] gas and oil are two key energies in the modern events dealing with the relation between security and energy. This does not exclude other energies, only attributes lesser importance to them. According to Yergin[3] energy security considering also entails electrical energy, in addition to oil and gas. Including electrical energy into the field of consideration results in adding coal, hydro-potential, nuclear energy, renewable energy and all other energies for producing electrical energy. These three elements form the main connection between security and energy (figure 1).

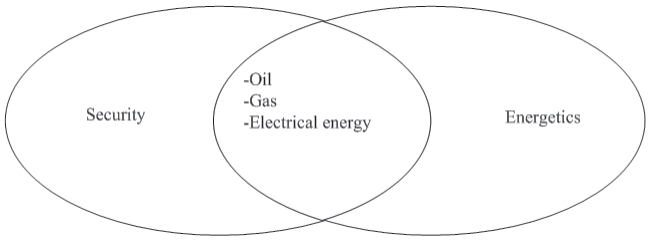

Figure 1. Simplified display of the relation between Security and Energetics

1 Đajić, N. 2002. *Energija za održivi svet*. Belgrade: Faculty of Mining and Geology. pp. 4.
2 Simurdić, M. 2009. "Gasna kriza i energetska bezbednost". *Međunarodna politika*. vol. 60. no. 1133. pp. 48.
3 Yergin, D. 2006. "Ensuring Energy Security". *Foreign affairs*. vol. 85. no.2. pp. 70.

What gives security dimension to the energetic issues is their influence on the security state. What speaks most in favour of this fact are the consequences following the crisis of supply – oil and gas crisis, as well as shortage of electrical energy[4]. Depending on the length and intensity of the crisis, slight or more significant consequences concerning security followed, either directly or indirectly. The most significant of them establishing the relationship between the energetic and security problems occurred in the 70s of the previous century, when it comes to oil and in the first decade of this century when it comes to gas. Shortage of supply of electrical energy is one of the most significant; it took place in New York in 1977 when thousands of people roamed the streets, broke shop windows, set shops on fire and plundered throughout the town[5]. Furthermore, it is important to note that the consequences of the crises mentioned directly influenced the developed, western world, which goes to show that the degree of development is connected to energy. In line with that Kovač and Stojković point out that energy is the prerequisite of economic growth[6]. It is possible to conclude that the better part of the above goes to show the viewpoint of the West on the rest of the world which questions the connection in figure 1 and its correctness.

Figure 2. shows the consumption of electrical energy in the world; it is obvious that certain regions (e.g. Africa) spend 5 to 20 times less electrical energy than the most developed ones (USA). It is therefore possible to state another question: is there a connection between security and energetic in such regions, especially given the fact that there are regions on Earth where there are no electrical energy consumption. It is similar with oil, and especially gas which is, in the better part of the world, considered a new type of energy.

Figure 2: Electricity Consumption / Population[7]

Analysis so far shows that there is a connection between energy and security, but that "At different time, in different countries the crucial elements of energy security will vary"[8]. Structure and intensity of the relation depend on the development level of the state/region; viz. the degree of interdependence of vital social functions of the particular society from energy i.e. particular energies and the moment analysis is performed. When talking about Serbia, oil, gas and electrical energy can be considered key elements of energy security.

HISTORICAL PERSPECTIVE

The beginning of the nowadays energetic problems, but also one of the greatest turning points in the development of the human society is the discovery of oil. The first record of oil being first used in energetic was in petroleum lamps in 1859[9]. The moment when the need for oil assumed

4 Božanić, D. 2011. *Energetska bezbednost Republike Srbije.* Belgrade: Faculty of Political Sciences. pp. 9-11.
5 Blackout History Project. Available at: http://blackout.gmu.edu/events/tl1977.htlm (Accessed on 18.05.2011.).
6 Kovač, M. and Stojković D. 2009. *Strategijsko planiranje odbrane.* Belgrade: Vojnoizdavački zavod. pp. 95.
7 International Energy Agency. Available at: http://www.iea.org/country/maps.asp (Accessed on 22.01.2013.).
8 Barton, B, Redgwell, C, Rønne, A. and Zillman, D.N. 2004. *Energy Security: Managing Risk in a Dynamic Legal and Regulatory Environment.* Oxford: Oxford University Press. pp. 5.
9 *Opšta enciklopedija larousse.* Tom 3. 1973. Belgrade: Vuk Karadžić. pp. 890.

larger proportions was When the first engines running on oil derivatives were used.[10], Before the First World War the demand for oil was relatively small and therefore no greater impact on security could be attributed to it[11]. Greater demand for oil began at the beginning of XX century, when the British Navy (during WW1) started using oil instead of coal in their vessels, and when the development of the automotive industry and aviation become dramatic. The future significance of oil was recognized after the First World War. Through huge efforts of the Minister of Foreign Affairs Lord Curzon, interestingly enough connected to the British oil industry, Great Britain managed to attach the territory of the nowadaus Northern Iraq to Iraq and not Turkey and therefore this territory fell into the interest zone of the Great Britain[12]. France also recognized the significance of oil; using peace treaties France also gained a share in the Iraq oil. Great statesmen of the time also addressed the issue of oil. President of the USA, Woodrow Wilson, stated that "international significance of a nation will depend on its oil reserve"[13], while for *Georges Benjamin Clemenceau*, French Prime Minister, "A drop of oil is worth a drop of blood." The weight of these statements is shown between the two wars when the oil industry becomes one of the strongest branches of economy[14]. Dominance over oil wells becomes a prerequisite of power and an important segment of foreign affairs. In that sense, *New York Herald Tribune* published in 1948 that there is no state with so many developed technical doctrines on oil as the USA, adding that no other state depended on the power given by oil as the USA[15].

DEFINING (THEORETICAL) CONCEPT OF ENERGY SECURITY IN LITERATURE

"Energy security"is a relatively new term in the security studies. Though many question this concept, energy security has, in a specific way, drawn attention to a set of security questions relating to stable energy supply. Bearing in mind that the main issue of connecting concepts and theories is that they have been developed to serve a purpose or purposes[16], then energy security can be considered a concept as it stresses the unavoidable link between energy and security in the modern society; and it is well known that societies are more sensitive and prone to action when their security is concerned. Energy security has no universal meaning, which demeans it by no means as it is possible to find practical examples that have no universal definition but are none the less applied, as it is the concept of the security sector reform.

Development of the modern approach to energetic problems can be divided into two periods. The first one ranges, from the beginning of wider usage of oil to move ships and cars until the first oil crisis. Abundance of oil has provided low prices and availability to consumers, while buying and selling goes through free market. The turning point is marked by the first oil crisis in 1973. For the first time it was obvious that power can grow from "a barrel of oil", historical precedence occurred when military and economic power were separated[17]. After the crises industrialized countries created energy security system "to ensure coordination among the industrialized countries in the event of a disruption in supply, encourage collaboration on energy policies, avoid bruising scrambles for supplies, and deter any future use of an "oil weapon" by exporters"[18]. Its key elements are the International Energy Agency (IEA), whose members are the industrialized countries; strategic stockpiles of oil; continued monitoring and analysis of energy markets and policies; and energy

10 1876th Nicolaus August Otto was constructed a four-stroke internal combustion engine, and the 1897th Rudolf Diesel constructed the first diesel engine. For the period since 1900. to 1910. The car industry industry is experiencing its progress.
11 It can not be said possession a shortage of resources did not affect the security of the state An example, the long war between France and Germany around Sara and Rura and rich deposits of coal and iron in HIH and the first half of XX century was one of the main raw materials for the starting of industry. The main reasons are that the whole society was not depended on of the energy and understanding of energy security had a different basis.
12 Đokić, B. 2009. „Energetski ratovi". *Nin.* no. 30, pp. 40.
13 Vučković, M. 2003. *Kap krvi za kap nafte-geneza iračke krize.* Belgrade: Čigoja Štampa. pp. 22. in: : Lazić, S. 2009. Energetska bezbednost Evropske unije kao činilac njenih odnosa sa Rusijom. Belgrade: Faculty of Security Studies. pp. 3.
14 *Opšta enciklopedija larousse*. Tom 3. 1973. Belgrade: Vuk Karadžić. pp. 890.
15 Đukić, S. 2009. *Vreme energije.* Belgrade: Službeni glasnik. pp. 3.
16 Kerr, P. "Ljudska Sigurnost". pp. 115. in: Collins, A. (ed.) 2010. *Suvremene sigurnosne studije.* Zagreb: Politička kultura.
17 Nye, J. S. 2006. *Understanding International Conflicts.* Belgrade: Stubovi kulture. pp. 258.
18 Yergin, D. 2006. "Ensuring Energy Security". *Foreign affairs*. vol. 85, no.2, pp.75.

conservation and coordinated emergency sharing of supplies in the event of a disruption[19]. This crisis has made oil, and later other energetics, rise from the state of trading goods traded according to the principles of economy. The problem of energy security has made it to the schedule of the world political scene[20].

Most authors agree that the term of energy security has no universal meaning. Along the energetic chain (oil and gas), over transit states to the consumers, energy security is interpreted in different ways, depending what the viewpoint is – producers, consumers or transit states[21]. Furthermore, energy security is connected to the geographical positions of the state[22].

Yergin[23] distinguishes three categories according to which the state defines energy security: energy exporting countries in which energy security entails an ongoing maintenance requirements for energy to be exported and thus increasing the state revenues; the developing countries whose major concern is the change in energy prices and the impact of these changes on their further development; the countries dependent on the imported energy, such as the USA, for which energy security involves the security of energy supplies, especially oil and gas in sufficient quantities at affordable prices. Though most states can fall under the above division, Yergin[24] goes to define energy security in single states: for Russia, "the aim is to reassert state control over "strategic resources" and gain primacy over the main pipelines and market channels through which it ships its hydrocarbons to international markets"; for China and India, "energy security now lies in their ability to rapidly adjust to their new dependence on global markets, which represents a major shift away from their former commitments to self-sufficiency" ; for Japan, "it means upsetting its stark scarcity of domestic resources through diversification, trade, and investment; in Europe, the major debate centers on how to manage dependence on imported natural gas—and in most countries" and the United States goal of "energy independence".

The New Energy Security Paradigm[25] points out that the term energy security includes energy, economic growth and political power and the definition itself varies depending on the interests of the side it is defined for. The given text, in addition to the specificity of the term in dependant states, developing states and states exporting energy[26] emphasizes that political decision makers, when considering the energy security, focus on securing the infrastructure from terrorist attacks, wars and natural disasters, while large companies worry about the integrity of the entire power grid. For this reason, energy security is shown as an *umbrella term* including a number of elements (figure 3.).

Daojiong[27] goes to say that the term energy security is by no means a simple combination of energy and security and that it contains three key goals: the availability of energy required for economic and social growth, freedom from interruptions in supply and availability of energy at favourable prices. The goals set indicate primarily to achieving the national prosperity, while the necessary components of energy and security are only in the background. He[28] adds that the military power is not the basic instrument for achieving energy security and that the key role is played by the geopolitical factors and national policies of the countries controlling the development of energy resources and transport. This claim is shared by Sharma[29] who points out that energy security entails components of geopolitics and bilateral relations (in addition to diversifying the sources of supply and

19 Ibid
20 Nikolić, S. 2008. "Energy Security as a Factor of US Foreign Policy at the Beginning of the 21st Century". *Vojno delo*, vol. 60. no. 2. pp. 30; Novičić, Ž. and Đukanović, D. „Energetska bezbednost: globalni trendovi i interes Srbije". pp. 429. in: Jeftić-Šarčević, N. (ed.) 2010. *Serbia in contemporary geo-strategic surroundings*. Internacional conference. Belgrade, 21.09.2009.
21 Novičić, Ž. and Đukanović, D. „Energetska bezbednost: globalni trendovi i interes Srbije". pp. 420 421. in: Jeftić-Šarčević, N. (ed.) 2010. *Serbia in contemporary geo-strategic surroundings*. Internacional conference. Belgrade, 21.09.2009.; *The New Energy Security Paradigm*. 2006. World Economic Forum in partnership with Cambridge Energy Research Associates. pp. 9. Available at: https://members.weforum.org/pdf/Energy.pdf (Accessed on 18.01.2013.)
22 Ibid
23 Yergin, D. 2006. "Ensuring Energy Security". *Foreign affairs*. vol. 85, no.2, pp. 70-71.
24 Ibid, pp. 71
25 *The New Energy Security Paradigm*. 2006. World Economic Forum in partnership with Cambridge Energy Research Associates. pp. 9. Available at: https://members.weforum.org/pdf/Energy.pdf (Accessed on 18.01.2013.)
26 Energy security in subsidiaries countries, developing countries and countries that export energy defines in a similar way as inYergin.
27 Daojing, Z. 2006. "Energy Interdepedence". *China Security*. no. 2. pp. 2-3.
28 Ibid
29 Sharma, A. 2007. "India and Energy Security". *Asian affairs*. vol. 38. no 2. pp. 159.

types of energy through renewable and nonrenewable sources). Stringer[30] believes that in considering energy security all elements of national power such as: diplomacy, armed forces, economy and informal connections must be taken into account. This speaks in favour of Yergin's[31] that concept of energy security does not stand alone, but that it gains importance in interaction between states.

The modern EU understanding of energy security can be defined as "managing demand, diversification of energy sources by using renewable sources, creation of a streamlined internal energy market and controlling external supply by reaching special relations with supplier countries" [32]. Such definition is the result of EU's energetic dependence and her desire for a more stable energetic market.

Figure 3: Energy security like umbrella term[33]

Barton at al.[34] define energy security as "a condition in which a nation and all, or most, of its citizens and businesses have access to sufficient energy resources at reasonable prices for the foreseeable future free from serious risk of major disruption of service." Nadić and Milašinović[35] believe that such definition places energy security into a sub-type of national security, so it could be considered close to energetic independence. Therefore, they define the global energy security as process in which stable, secure and continuous flow of energies (primarily oil and gas) is ensured in all nations, at the same time providing the minimum interest of the producer, viz. stable prices and constant demand.

Tatalović[36] believes that energy security is an important segment of national security of each state and not just for its economic growth but also for the sustainability of the modern society. Key elements of energy security he stresses are availability of energies and their sources, and none the less important protection of the crucial infrastructure in direct link with the safety of supply. Tatalović justifiably stresses the significance of energy infrastructure protection as gas and oil lines

30 Stringer, K. 2008. "Energy Security: Applying a Portfolio Approach". *Baltic Security & Defence Review.* vol. 10. pp. 122-123.
31 Yergin, D. 2006. "Ensuring Energy Security". *Foreign affairs*. vol. 85, no.2, pp. 69.
32 European Commission. 2004. *Report on the Green Paper on Energy.* in: Grošelj, K. 2009. "Energy Security in Russia – EU Partnership". *Politics in Central Europe*. vol. 5. no. 1. pp. 8-9.
33 Cambridge Energy Research Associates in: *The New Energy Security Paradigm*. 2006. World Economic Forum in partnership with Cambridge Energy Research Associates. pp. 8. Available at: https://members.weforum.org/pdf/Energy.pdf (Accessed on 18.01.2013.)
34 Barton, B, Redgwell, C, Rønne, A. and Zillman, D.N. 2004. *Energy Security: Managing Risk in a Dynamic Legal and Regulatory Environment.* Oxford: Oxford University Press. pp. 5.
35 Nadić, D. and Milašinović, S. 2009. "Politička ekologija energetske bezbednosti". *Nauka, bezbednost, policija.* vol. 14. no. 3. pp. 135.
36 Tatalović, S. 2008. "Energy Security and Security Policies: The Republic of Croatia in Comparative Perspective". *Politička misao.* vol. 45. no. 1. pp. 117 -118.

are especially vulnerable to terrorist attacks, due to their length[37]. The data for the period between 2003 and 2008 speaks in favour of this as there were more than 600 attacks on the pipelines in Iraq[38].

Serbian authors have also been trying to define energy security. According to Simurdić[39] energy security means stable demand and favourable prices, so that high research, production and building costs of transport infrastructure: oil and gas lines are justifiable for producers. For consumers, reliable supply at affordable prices is crucial, while transit states count with the fact that such position guarantees supply and tax on transit income. Two main elements he singles out are – stable and safe supply и rounded competitive energies market[40]. Similar to the previous definitions, Jelena Radoman[41] defines energy security on global and national levels as "availability of energies in sufficient quantities and at favourable prices, stable supply and physical safety of gas and oil lines. "

Previously said point to a great extent to the lack of consensus related to defining energy security making this concept unfinished and open to further upgrade. However, despite this, it has not lost its significance. Through the development of the energy security concept two dimensions have emerged – inner and outer[42]. Outer dimension includes safety in supply, which is to a great extent determined by the state of energetic (in) dependence, while the inner dimension groups a number of measures undertaken by the state in order to increase the level of energy security internally[43]. Measures like regulating the market, liberalization, increase of the energetic efficiency etc. are usually in function of the decrease of energetic dependence but not full elimination of it, and therefore it can be concluded that these two dimensions are difficult to separate.

MAIN CRITIQUES OF THE ENERGY SECURITY CONCEPT

Bearing in mind that most theoreticians do not dispute the fact that security represents one of the fundamental needs including the warranty of safety and prosperity, economic stability, social order and life without fear[44], and that from state, security has become public good[45]; security can be considered one of the most significant elements of life for the modern individual/society. Nowadays, making a large number of non military threats safe has made non-military and traditional military threats equal[46]. The list of non-military threats is constantly growing, which would mean that the loose limit of what forms a security threat is being constantly pushed[47].

Energy security represents one of the recent, non-military threats, and the lack of a precise definition of the concept of energy security is definitely one of its key conceptual pints of criticism. The elastic definition shows certain dilemma which are energetic, which security, and which are not so some energy-related issues it is possible to consider from the security or some other standpoint, depending on the present needs and goals set by those considering it. A good example would be disputes over gas between the EU and Russian Federation. For the EU the cut of supply of gas to Ukraine is a security question, and the Russian Federation, non-the-less convincingly claims that the issue is of purely economic nature[48].

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37 Simić, S. "Terorism and energy security". pp. 352. in: Šikman, M. and Amidžić, G. (ed.) 2011. *Suprotstavljanje terorizmu-međunarodni standardi i pravna regulativa*. Internacional scientific conference. Kozara, 29.-30.03.2011.
38 Ibid
39 Simurdić, M. 2009. "Gasna kriza i energetska bezbednost". *Međunarodna politika.* vol. 60, no. 1133. pp. 54.
40 Simurdić, M. 2009. "Evropska strategija bezbednosti i energija". *Evropske sveske.* no. 6. pp. 7.
41 Radoman, J. 2007. "Sekuritizacija energije kao uvod u energetsku bezbednosnu dilemu". *Western Balkans Security Observer*. no 4. pp. 36-37.
42 Novičić, Ž. and Đukanović D. „Energetska bezbednost: globalni trendovi i interes Srbije". pp. 421. in: Jeftić-Šarčević, N. (ed.) 2010. *Serbia in contemporary geo-strategic surroundings*. Internacional conference. Belgrade, 21.09.2009.; Simurdić, M. 2009. "Gasna kriza i energetska bezbednost". *Međunarodna politika.* vol. 60. no. 1133. pp. 55.
43 Ibid
44 Nikolić, S. 2008. "Energy Security as a Factor of US Foreign Policy at the Beginning of the 21st Century". *Vojno delo*. vol. 60. no. 2. pp. 30.
45 Hadžić, M. 2007. "Uloga nevladinih organizacija u regionalnoj bezbednosnoj saradnji". *Western Balkans Security Observer*. no 6. pp. 44.
46 Simić, R. D. 2002. Nauka o bezbednosti. Belgrade: Službeni list SRJ and Faculty of Political Sciences. pp. 35-43.
47 Ibid
48 Radoman, J. 2007. "Sekuritizacija energije kao uvod u energetsku bezbednosnu dilemu". *Western Balkans Security Observer.* no 4. pp. 38.

Though this is a threat recognized by most countries worldwide, opposite conceptual settings in certain groups of countries is a huge disadvantage. Therefore it is not possible to define a single, universal manner/model of reaching energy security, or a universal model to evaluate the level of energy security and the success in reaching it.

DEFINING REPUBLIC OF SERBIA ENERGY SECURITY

Strategy of the national security of the Republic of Serbia[49] in the section *economic policy* defines energy security as entailing divergent ways of provision, constant supply and production of energies, providing the necessary autonomy and reinforcing the regional position in energetic supply. However, the following passage defines ensuring population defensive and security measures and providing logistic support to all the structures in the system of national security in case of security threats, according to the state possibilities as goal of the economic policy measures. A goal set in this manner, in certain way, narrows down the previously defined term of energy security and primarily relates it to the military security. However, connecting energy exclusively to the military security rises the question of whether the population can feel energy security if the only energetically safe facilities are those within the system of national security?

The programme of effectuating the strategy of the development of energetic of the Republic of Serbia until 2015 defines the main conditions for achieving energy security for the period between 2007 and 2012[50]: safety of energy supply, importance of correct choice of optimal combination of fuel and energies, more energy and energies suppliers, maximum use of local fuels and responsibility of the local management in ensuring energy for the population and industry.

Defining energy security is connected to its state of high energetic dependence (table 1), and also the fact that there is only one source of supply (Russian Federation), and that supply is done via a single pipeline.

year / energy	2004	2005	2006	2007	2008	2009	2010	2011	Average dependence rate 2004 - 2011
oil and its derivatives	83.5	82.8	85.7	90.4	84.7	79.3	75.6	69.9	**81.5 %**
gas	88.1	88.5	88.9	89.4	89.7	90.4	84.6	85.9	**88.2 %**
coal	8.2	9,4	11.,9	10.1	10.7	7.3	9.4	8.9	**9.5 %**
overall energetic dependence	40.85	40.95	40	42.8	40.22	33.71	33.55	31.98	**38 %**

Table 1. Rates of energy security of Serbia[51]

The given definitions and the state of energetic dependence set the basis in defining the concept of energy security applicable to Serbia. Starting from their common ground, it can be concluded that energy security of Serbia is dependent on the availability of the sufficient quantities of energies, satisfactory quality and affordable prices, continuity of supply, as well as the physical safety of transport, refining and storage capacities over an extended period of time[52]. Energy security, in the material sense is made up of the lack of significant threats that can endanger the elements listed above, viz. the lack of fear that these elements would be jeopardized in the constructive approach. Furthermore, energy security of Serbia is the capability of the state to continue operating throughout the

49 National Security Strategy of the Republic of Serbia. 2009. pp. 21-22. Available at: http://www.mod.gov.rs/lat/dokumenta/strategije/strategija_%20nacionalne_bezbednosti_lat.pdf (Accessed on 21.01.2010.)

50 Program ostvarivanja strategije razvoja energetike RS do 2015. za period 2007 – 2012. pp. 41. Available at: http://www.mem.gov.rs/ (Accessed on 05.08.2010.)

51 Source: *Energetski bilans Republike Srbije* for: 2006, 2007, 2008, 2009, 2010, 2011. and 2012.

52 Božanić, D. 2011. *Energetska bezbednost Republike Srbije.* Belgrade: Faculty of Political Sciences. pp. 26.

whole or better part of it over a period of time, in case energies import is stopped[53]. "Certain period of time" represents sufficient time to overcome the disruptions in supply and provide energetic stability. In order to overcome these disruptions, the EU has prescribed mandatory energies reserve. European standards oblige every EU member to build and sustain strategic reserve of oil and oil derivatives over a period of 90 days of yearly consumption of this member, which has been adopted from the OECD model who have the same obligation[54]. Directive of the EU on the security of gas supply from July 2009 all member states are obliged to provide gas reserve for a minimum of 60 days of lack of supply by March 2014[55]. The European orientation of Serbia implies the implementation of European standards in all areas, including security /energetic, and therefore a reasonable interval in which a state, Serbia included, should be able to deal with the cut in supply determines 60 days for gas and 90 days for oil.

CONCLUSION

The amenities of the modern life are directly connected to the energy consumption. Energy has become so significant that it is difficult what the world would be like without it and how it would function. Such impact of the social development has influenced the addition of a security angle in considering oil and gas. Such significance for the development of society has contributed to regarding oil, gas and electrical energy from the security prospective. Most authors concur that oil and gas are the security issues of the modern world. When it comes to the electrical energy there are authors who undermine its meaning, though they still classify it as security issue, especially in the developed countries. Historically speaking, the impact of energy on the human society has grown continually, and the trend is expected to continue in the future.

The key moment when it was clear to all that oil, and nowadays gas and electrical energy, were not casual merchandise was the oil crisis of 1973. Since then, high political circles worldwide have put energy on their agenda, and literature dealing with security issues has been discussing energetic questions more and more. Though a new term – energy security – has been established rather quickly it remains ambiguous and open to further upgrade. It turns out that energy security is interpreted in different ways in producer, consumer or transit states.

According to the general definition, the conclusion on what the energy security of the Republic of Serbia means has been drawn. It turned out that its definition is related to the high energy dependence. Therefore, the Republic of Serbia should be focused on the availability, quality and affordable prices as well as ensuring the continuity of supply in achieving energy security. Also, special capabilities to overcome the energy shortage should be developed. Thus defined concept of energy security could be applied to other energy-dependent states.

REFERENCES

1. Barton, B, Redgwell, C, Rønne, A. and Zillman, D.N. 2004. *Energy Security: Managing Risk in a Dynamic Legal and Regulatory Environment.* Oxford: Oxford University Press.
2. Blackout History Project. Available at: http://blackout.gmu.edu/events/tl1977.htlm (Accessed on 18.05.2011.).
3. Božanić, D. 2011. *Energetska bezbednost Republike Srbije.* Belgrade: Faculty of Political Sciences.
4. Cambridge Energy Research Associates in: *The New Energy Security Paradigm*. 2006. World Economic Forum in partnership with Cambridge Energy Research Associates. Available at: https://members.weforum.org/pdf/Energy.pdf (Accessed on 18.01.2013.)
5. Daojing, Z. 2006. "Energy Interdepedence". *China Security*. no. 2. pp. 2-16.
6. Đajić, N. 2002. *Energija za održivi svet*. Belgrade: Faculty of Mining and Geology.

53 Ibid
54 Kovačević, L.B., Kovačević, A. and Zakova, A. 2010. *Energetika (Vodič kroz EU)*. Loznica: Mladost. pp. 77-78.
55 Mihajlović Milanović, Z. "Energetska bezbednost zemalja jugoistočne Evrope u svetlu ruske energetske politike". pp. 58. in: *Šesti izveštaj projekta Praćenja Rusko-Srpskih odnosa.* Available at: http://www.isac-fund.org/lat/publishing.php (Accessed on 28.06.2010.)

7. Đokić, B. 2009. "Energetski ratovi". *Nin.* no. 30, pp. 38-41.
8. Đukić, S. 2009. *Vreme energije.* Belgrade: Službeni glasnik.
9. Energetski bilans Republike Srbije za 2006. godinu. Available at: http://www.mem.gov.rs/ (Accessed on 05.08.2010.)
10. Energetski bilans Republike Srbije za 2007. godinu. Available at: http://www.mem.gov.rs/ (Accessed on 05.08.2010.)
11. Energetski bilans Republike Srbije za 2008. godinu. Available at: http://www.mem.gov.rs/ (Accessed on 05.08.2010.)
12. Energetski bilans Republike Srbije za 2009. godinu. 2008. *Službeni glasnik Republike Srbije.* no. 101. pp. 3-9.
13. Energetski bilans Republike Srbije za 2010. godinu. 2009. *Službeni glasnik Republike Srbije.* no. 109. pp. 26-32.
14. Energetski bilans Republike Srbije za 2011. godinu. 2010. *Službeni glasnik Republike Srbije.* no. 102.
15. Energetski bilans Republike Srbije za 2012. godinu. 2012. *Službeni glasnik Republike Srbije.* no. 1.
16. European Commission. 2004. *Report on the Green Paper on Energy.* in: Grošelj, K. 2009. "Energy Security in Russia – EU Partnership". *Politics in Central Europe*. vol. 5. no. 1. pp. 5-19.
17. Hadžić, M. 2007. "Uloga nevladinih organizacija u regionalnoj bezbednosnoj saradnji". *Western Balkans Security Observer.* no 6. pp. 38-44.
18. International Energy Agency. Available at: http://www.iea.org/country/maps.asp (Accessed on 22.01.2013.).
19. Kerr, P. "Ljudska Sigurnost". pp. 114-132. in: Collins, A. (ed.) 2010. *Suvremene sigurnosne studije.* Zagreb: Politička kultura.
20. Kovač, M. and Stojković D. 2009. *Strategijsko planiranje odbrane.* Belgrade: Vojnoizdavački zavod.
21. Kovačević, L.B., Kovačević, A. and Zakova, A. 2010. *Energetika (Vodič kroz EU)*. Loznica: Mladost.
22. Mihajlović Milanović, Z. "Energetska bezbednost zemalja jugoistočne Evrope u svetlu ruske energetske politike". pp. 51-58. in: *Šesti izveštaj projekta Praćenja Rusko-Srpskih odnosa.* Available at: http://www.isac-fund.org/lat/publishing.php (Accessed on 28.06.2010.)
23. Nadić, D. and Milašinović, S. 2009. "Politička ekologija energetske bezbednosti". *Nauka, bezbednost, policija.* vol. 14. no. 3. pp. 134-151.
24. National Security Strategy of the Republic of Serbia. 2009. Available at: http://www.mod.gov.rs/lat/dokumenta/strategije/strategija_%20nacionalne_bezbednosti_lat.pdf (Accessed on 21.01.2010.)
25. Nikolić, S. 2008. "Energy Security as a Factor of US Foreign Policy at the Beginning of the 21st Century". *Vojno delo*. vol. 60. no. 2. pp. 29-50.
26. Novičić, Ž. and Đukanović, D. "Energetska bezbednost: globalni trendovi i interes Srbije". pp. 419-437. in: Jeftić-Šarčević, N. (ed.) 2010. *Serbia in contemporary geo-strategic surroundings*. Internacional conference. Belgrade, 21.09.2009.
27. Nye, J. S. 2006. *Understanding International Conflicts.* Belgrade: Stubovi kulture.
28. *Opšta enciklopedija larousse*. Tom 3. 1973. Belgrade: Vuk Karadžić.
29. Radoman, J. 2007. "Sekuritizacija energije kao uvod u energetsku bezbednosnu dilemu". *Western Balkans Security Observer*. no 4. pp. 36-43.
30. Sharma, A. 2007. "India and Energy Security". *Asian affairs*. vol. 38. no 2. pp. 158-172.
31. Simić, R. D. 2002. Nauka o bezbednosti. Belgrade: Službeni list SRJ and Faculty of Political Sciences.
32. Simić, S. "Terorism and energy security". pp. 349-360. in: Šikman, M. and Amidžić, G. (ed.) 2011. *Suprotstavljanje terorizmu-međunarodni standardi i pravna regulativa*. Internacional scientific conference. Kozara, 29.-30.03.2011.
33. Simurdić, M. 2009. "Evropska strategija bezbednosti i energija". *Evropske sveske.* no. 6. pp. 6-7.
34. Simurdić, M. 2009. "Gasna kriza i energetska bezbednost". *Međunarodna politika.* vol. 60, no. 1133. pp. 48-58.

35. Stringer, K. 2008. "Energy Security: Applying a Portfolio Approach". *Baltic Security & Defence Review.* vol. 10. pp. 121-142.

36. Tatalović, S. 2008. "Energy Security and Security Policies: The Republic of Croatia in Comparative Perspective". *Politička misao.* vol. 45. no. 1. pp. 115 -134.

37. The New Energy Security Paradigm. 2006. World Economic Forum in partnership with Cambridge Energy Research Associates. Available at: https://members.weforum.org/pdf/Energy.pdf (Accessed on 18.01.2013.)

38. Vučković, M. 2003. *Kap krvi za kap nafte-geneza iračke krize*. Belgrade: Čigoja Štampa. in: Lazić, S. 2009. Energetska bezbednost Evropske unije kao činilac njenih odnosa sa Rusijom. Belgrade: Faculty of Security Studies.

39. Yergin, D. 2006. "Ensuring Energy Security". *Foreign affairs*. vol. 85, no.2, pp. 69-82.

40. Program ostvarivanja strategije razvoja energetike RS do 2015. za period 2007 – 2012. Available at: http://www.mem.gov.rs/ (Accessed on 05.08.2010.)

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SUBVERSIVE ACTIVITIES AGAINST SERBS AND SERBIA

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INTRODUCTION

Changes in the architecture of global security at the end of the twentieth century, especially the implications of these changes in the former Yugoslavia and later in the Federal Republic of Yugoslavia (FRY) and Serbia, represent a significant period in the history of Serbian people, which were particularly affected with these changes and the collapse of former Yugoslavia and later the FRY. During these events Serbs have earned a very bad reputation as a nation that is "responsible for everything that happened" in the former Yugoslavia. Various subversive activities of various interest groups and the states have contributed such attitudes toward Serbs. The aim of this paper is to present some key subversive activities through four periods of time, that contributed to the creation of bad "image" about Serbs in the world and marginalization of Serbia in the Balkans.

Subversion "is an organized activity directed against the legal and social structure of a country, and carried by a certain state, political organizations, groups, and so on, with the intention to change the existing system of governance and socio-economic system of a country."[1] Some choose to define subversion as "non-violent terrorism", while Frenk Kitson, a British expert on counterinsurgency operations, says for the subversion that those are all illegal means, but not the use of the armed forces, undertaken by a group of people in the country, in order to overthrew the government of that country, or to force the government to do something they do not want.[2]

Subversion is achieved through a range of activities that can be classified into several activities, as follows: subversive propaganda activities; assassinations and organizing state coups; armed rebellions; terrorist activities; diversions; espionage; sabotage. Each of these activities has its holders and ways of implementation. It is important to note that some carriers may implement more activities but each of these activities do not take place independently but are intertwined and implemented simultaneously thereby realize the full effects of subversion.

Very common way to do subversive activities against Serbs and Serbia was and still is propaganda. "Propaganda is a term that implies an organized and purposeful activity of an individual, a group, an organization with the goal of influencing public opinion, and that certain views and ideas attract more followers."[3] Methods of propaganda are: spreading rumors, manipulating the size and effect of the majority, causing conflicts between the various groups, falsification of documents, disclosure of those in power, blackmail, insinuations, threats, intimidation, and others.[4] The basic division of propaganda is on: white, black and gray propaganda. This division is now widely accepted. The basis for the distribution of propaganda in white, black and gray is a source of propaganda. For white propaganda the source is known, for the black and gray the source is unknown but for gray propaganda the source is possible to detect under certain circumstances.

THE PHASES OF SUBVERSIVE PROPAGANDA AGAINST SERBIAN PEOPLE

Subversion is primarily a political tool, and key element of it is propaganda. The subversive propaganda has been used to change the political, social and economic relations in a country, region or organization. The ways to do that can be different. Tofflers talk about six different tools for mind

1 Milašinović M. R. (1998): Teror zapada nad svetom, Idij, Veternik, p.166
2 Rosenau W. (2007): Subversion and Insurgency, Occasional Paper, National Defense Research Institute, RAND Corporation, p. 5
3 Politički leksikon (1980), Savez publicista Srbije, Beograd, p. 370
4 Abazović D.M. (2002): Državna bezbjednost-uvod i temeljni pojmovi, Fakultet kriminalističkih nauka, Sarajevo, p. 234

changing. One of the most common is accusation of a crime. Secondly, there is a story about all good and important things that can be in danger if we do not do anything. Next one is demonization and dehumanization of the enemy. After that there is an attitude: "Who is not with us, is against us!" Last two tools are "calling for God's help" and propaganda which discredits the propaganda of the enemy.[5] Keeping this in mind, it is easy to identify various activities conducted against the FRY in the last decade of the 20th century. The combination of freedom of speech with variety of non-governmental organizations "for this and that" and "independent" media was a winning formula in the subversive propaganda war against former Yugoslavia and against the FRY and Serbia today. Various legal and semi-legal methods were used by powerful states to rock public opinion and politics in the various countries.

Subversive activities that were being implemented against Serbs in former Yugoslavia and now in Serbia can be divided into four periods:

– The first period or period of design - from the mid 1980s to the outbreak of war in Bosnia and Herzegovina;
– The second period or period of confirmation - covers the period of the war in Bosnia and Herzegovina from 1992 to 1995;
– The third period is the period of exploitation - from the end of the war in Bosnia and Herzegovina to Slobodan Milošević's departure from power;
– The fourth period is an "open door" period – from departure of Milosevic from the power and continues to day.

The perod of design

The first period of subversive activities called period of design, was focused to create an image of Serbs as offenders for the collapse of former Yugoslavia. Since former Yugoslavia was non-bloc and non-aligned country, at the end of the 20th century and the dissolution of the Warsaw Pact, its role had to be redefined. The politics of former Yugoslavia represented the struggle against the policy of force, and promoted politics of equality and non-interference in the internal affairs of countries. It was opposites of the modern expansionist imperial interests. Socio-political system and geography came in focus as the main magnets of various secret services and agencies that were using all kinds of subversive activities having tried to change the system and made their permanent presence in former Yugoslavia. Everything started at the beginning of 1980s and was focused on the most solid organization of former Yugoslavia, Yugoslav People's Army (JNA). The former federal Secretary for National Defense in former Yugoslavia, Fleet Admiral Branko Mamula, told of efforts by ethnic Albanians to subvert the armed forces. "'Between 1981 and 1987 a total of 216 illegal organizations with 1,435 members of Albanian nationality were discovered in the Yugoslav People's Army,'" he said. Admiral Mamula said that ethnic Albanian subversives had been preparing for "killing officers and soldiers, poisoning food and water, sabotage, breaking into weapons arsenals and stealing arms and ammunition, desertion and causing flagrant nationalist incidents in army units."[6]

Being aware of the strong influence of foreign governments and their intelligence services, in 1990 General Veljko Kadijević proposed to Borisav Jović, the first man of former Yugoslavia, to conduct a disclosure action of the CIA and the BND[7]'s impact on former Yugoslavia. The preparations for this campaign were made, and a group of seven inspectors of national security were appointed. But, the federal government had been already very weak. This plan was never implemented. [8]

The role of foreign diplomats in the Slovenia secession was very significant, especially at the beginning of 1990s. The U.S. Ambassador in Belgrade during 1990s Warren Zimmerman, the founder of the American campaign against Serbia, based on information which he got from Borislav Jović on the Republic Day (November 29, 1990), sent a report to the U.S. that the JNA would not react if Slovenia tried to do secession. Immediately after that Slovenia got the green light from the U.S.

5 Tofler A. & H. Tofler (1998), Rat i antirat, Paideia, Beograd, p. 195-197
6 Binder D., In Yugoslavia, Rising Ethnic Strife Brings Fears of Worse Civil Conflict, The New York Times, 1. November 1987, http://www.nytimes.com/1987/11/01/world/in-yugoslavia-rising-ethnic-strife-brings-fears-of-worse-civil-conflict.html, accessed on December 20, 2012
7 Sindler R.Dz. (2009), Nesveti terror – Bosna, Al Kaida i uspon globalnog džihada, Službeni glasnik, Beograd, p.148
8 Lopušina Marko (1997): CIA protiv Jugoslavije, Narodna knjiga, Beograd, p.9

through the statement of Lawrence Sidney Eagleburger that Americans were "more interested in democratization than the unity of Yugoslavia."[9]

One of the very impressive examples of subversive activities against former Yugoslavia was in May 1991. Stipe Mesić was elected the President of the Presidency of former Yugoslavia, and even he publicly said he would work to break up the country. He was elected on the basis of gross and systematic pressure from the European Union on former Yugoslavia (where Germany had the upper hand) because they were convinced that he would diligently fulfill all their requirements in terms of breaking up Yugoslavia.[10]

In Croatia at that time, Serbs were treated as citizens of the second range. What was real situation at that time in Croatia was visible from the report of some journalists who were in Zadar in May 1991. According the report of Dorian Alexander, the Kristal Night in Zadar on 2nd of May 1991, because of events which took place, reminded very much of the persecution of Jews during the Second World War. The Croatian police closed hermetically all approaches to the City, so Serbs could not escape. Croatian police started systematically to loot Serbian houses. In the afternoon, on 2nd of May 1991, Croats from neighboring villages arrived in the town, to take part in deportation of Serbs. Because of those events in Zadar a lot of Serbs left the town.[11] Similar testimony is given by Kurt Kepruner who witnessed those events in Zadar in May 1991. He said that he was in the town of Zadar when "Dalmatia's Kristal Night" happened. He reported that Serbian houses and shops were systematically destroyed. He compared it with Berlin of November 1938 and other towns in Germany. He also noticed that all had happened a lot of months before the war started.[12] Also Simon Visental reported that first refugees in former Yugoslavia were Serbs, 40,000 of them fled from Croatia.[13]

A key characteristic of the first phase of subversive propaganda activities against Serbs and Serbia was to create negative stereotypes about Serbs in western public. During this period, the Serbian side was in complete blockade and unable to tell their side of the story. In this kind of situation the next phase of subversive activities could be implemented in order to discredit Serbs completely and to put them in a dark side of history.

Period of confirmation

After creating the first image of Serbs as the "bad guys", a second stage in subversive propaganda war against the Serbs was ready to be implemented and that was the period of the war in Bosnia and Herzegovina, the period of confirmation. This meant that the image had been created about the Serbs during the 1990s and during the war in Croatia and Slovenia should have been confirmed in Bosnia and Herzegovina and Serbs and Serbia should have been definitely put in the role of "bad guys." After Serbs were accused of the war crimes, the next tool was "demonization and dehumanization"[14] of Serbs.

Thus historical determination, Bosnia and Herzegovina on 6 April 1992 (day when Hitler attacked the Kingdom of Yugoslavia in 1941), the West chose their side in the conflict and started with uncompromising campaign against the Serbs in Bosnia-Herzegovina and FRY. Germany, Britain and other European countries launched a series of activities which characterized Serbs as aggressors and criminals. Although the U.S. was not immediately in this with its European allies, on 6th August 1992, the U.S. President Bush in a speech in Colorado Springs gave basic assumptions of the U.S. and also the rest of the West, to the crisis and the war in former Yugoslavia. He defined the situation in Bosnia and Herzegovina as a humanitarian disaster with ethnic cleansing, which should have been stopped with all means.[15] That was the reason for economical and political isolation of Serbia. In the meantime, the main complaint was that the Serbs run "aggression" followed with

9 Ibid., p.13
10 Mialkovski M. (1996): Iznenađenje u subverzivnom ratu, Vojno delo, Novinsko-izdavačka ustanova „Vojska", No. 2, p. 83-101
11 Živković, N. (2003), Kako nas vide drugi: slika Srba u nemačkim medijima, Prometej, Novi Sad, p.32
12 Ibd. p. 33
13 TAC, 13. avgust 1992
14 Tofler A. & H. Tofler (1998), Rat i antirat, Paideia, Beograd, p. 195-197
15 Bush G., Remarks on the Situation in Bosnia and an Exchange With Reporters in Colorado Springs, 06.August 1992, http://bushlibrary.tamu.edu/research/public_papers.php?id=4645&year=1992&month=8, Assessed 23.12.2012

brutality, ethnic cleansing, rape, planning, establishing concentration camps, massacres and so on, and all of this was connected with strategy of creating the "Greater Serbia". By research of Bojan B. Dimitrijević, for the first time the term "ethnic cleansing" was mentioned in relation to the Serbs in Bosnia Herzegovina and it was used in the magazine "The Economist" on 09th May 1992 in the article titled "Blood and Tears". After that in the second half of 1992, according to the research of Dimitrijević, the massive use of that term when it came to the Serbs was a common thing.[16]

In that period there was especially significant propaganda in figures where the Western media were representing Muslim victims in the hundreds of thousands, and the number of expellees was including over 200,000 people. A particular effect had the piece of information on the number of Muslim women raped by Serbian soldiers where the numbers were going up to 50,000.[17] Based on this information, Fred Pelka used the term "femicide" in magazine "Humanist" against "non-Serb women", as part of Serbs strategy "to destroy Muslim and Croatian society".[18] Making a victim of Sarajevo, which was "easily strangled by Serbs", a new term "urbicide' appeared[19], which was tied exclusively to the Serbian soldiers and their activities in Bosnia and Herzegovina, while the conflict between the Muslims and Croats in Mostar was in second plan and it was reported as about an ordinary war of two warring sides.

Richard Holbrooke stated that over 300,000 people died in Bosnia and Herzegovina.[20] These falsehoods about the number of victims in Bosnia and Herzegovina represented the Serbs as monsters because they did not say how many Serbs there was in these alleged 300,000. I guess it meant that they were primarily Muslims/Bosniaks and Croats and no one was shouting on the Serbs. As if this was not a war. In January 1993, the Muslims through their propaganda already spread the news about 200,000 or more[21] Muslims killed by Serbs in Bosnia and Herzegovina. Even some journalists and officials supported the statement while it was clear to everyone that the total number of victims in Bosnia and Herzegovina is about 100,000 on all sides[22].

The same was done with Srebrenica and with the number of Muslims/Bosniaks who were killed in 1995. The figure of 8,000 is not the one that can be accepted.[23] With time, a large amount of information in favor of a smaller number of deaths was highlighted. So far 5,137 bodies have been found and buried[24] and a lot of them are those who died during the war from 1992 to 1995 and those who died fighting during the war in Srebrenica.[25]

The explosion in Sarajevo in 1992, in "bread line" was the reason that the FRY was declared as an aggressor in Bosnia and Herzegovina and Belgrade got economic blockade. When the economic blockade was removed by most European countries, the United States have maintained their blockade as a means to pressure and blackmail in the future. The second event was an explosion at the Sarajevo market Markale and that was the first case "Markale 1" when 68 people were killed. Although there was no direct evidence that the Serbs fired a shell, this event led to the bombing of the Serbs. The same scenario

16 Dimitrijevic B.B, 1.3.1.G. Medijski stereotipi o Srbima i Hrvatima u angloameričkoj javnosti tokom rata u Bosni i Hercegovini 1992-1995. godine, http://www.cpi.hr/download/links/hr/6964.pdf, Assessed 28.12.2012

17 Aleksandra Stiglmeier was the first to report about women raped by Serbs. It was in October and November 1992. Zivkovic N (2003), Kako nas vide drugi: slika Srba u nemačkim medijima, Prometej, Novi Sad, p.53

18 Pelka F. , Voices from a war zone, http://www.thefreelibrary.com/Voices+from+a+war+zone.-a017047276, Accessed 12. December 2012

19 Dimitrijevic B., Od medijskog stereotipa do vojne intervencije, Vojno delo, 2/1999, Beograd, p.60

20 Herman S.E., & D. Peterson, Milosevic's death in the propaganda system, Published in Z Magazine May, 2006, http://www.electricpolitics.com/2006/05/milosevics_death_in_the_propag.html, Assessed 12.01.2013

21 Ibd.

22 The Hague determined the number of victims of Bosnia-Herzegovina war: 68,101 Bosnians were killed, 22,779 Serbs, 8,858 Croats and 4,995 others, 20 May 2010, http://www.hercegbosna.org/vijesti/bih/haag-utvrdio-broj-zrtava-rata-u-bih-stradao-68101-bosnjak22779-srba8858-hrvata-i-4995-ostalih-1107.html, Accessed on January 15, 2013; The number of those who died in Bosnia-Herzegovina war 100,000, 22 November 2005, http://www.b92.net/info/vesti/index.php?yyyy=2005&mm=11&dd=22&nav_category=167&nav_id=180941, Accessed on January 15, 2013

23 Srebrenica-falsifikovanje istorije (2012), Istorijski projekat Srebrenica, Naš pečat doo, Beograd, p. 27-32

24 http://www.potocarimc.ba/_ba/mc/, Accessed on February 19, 2013

25 See: Edward S. Herman, "The Politics of the Srebrenica Massacre", July 7, 2005, http://www.zcommunications.org/the-politics-of-the-srebrenica-massacre-by-edward-herman, Accessed on December 23, 2012; Nebojsa Malic, "Silver City: Srebrenica 10 years Later" , July 7, 2005,http://original.antiwar.com/malic/2005/07/07/silver-city/, Accessed on December 26, 2012; Nebojsa Malic, "Smokescreen—Using Srebrenica" , July 14, 2005, http://original.antiwar.com/malic/2005/07/14/smokescreen/, Accessed on December 26, 2012; Judgment, Prosecutor v. Radislav Krstic (IT-98-33-T), transcript , 6 April 2001, p.9532, http://www.icty.org/x/cases/krstic/trans/en/010406ed.htm , accessed on February 19, 2013

was applied with the new explosion in 1995 known as "Markale 2".[26] That was the trigger to reinforce the NATO aircraft strikes on Serbs in order to force them to sit at the negotiating table.

The pressures on public opinion in the world, and the media blockade of Serbs and open support to the Muslims and Croats led to the completely wrong image of Serbs, Serbia and the war in the Balkans. Because of that, this was a confirmation phase of subversive propaganda which started in Slovenia, but the war was too short to reach the goal, and the demonization of Serbs continued throughout the wars in Croatia and Bosnia and Herzegovina.

The Exploitation phase

The third phase of subversive activities and propaganda, exploitation phase, against Serbs and the FRY is the phase after the war in Bosnia and Herzegovina, until Milosević was forced out from the power. The aim of this phase was to break the FRY and its internal structures, to separate Montenegro from Serbia, and to separate Kosovo from Serbian territorial composition. It was a period of mass phenomena "independent media", various non-governmental organizations and movements as well as the period of direct support to the separatists in Kosovo and Metohija.

Tim Marshall clearly described a distribution of operations for the planning and political war against Milosević: "Washington has given most of the money, and some ideas, the London threw themselves on the planning process, and both parties agreed to strengthen opposition and to help organizations such as "OTPOR" and the media such as B92." According to Vladimir Djukanović, the National Endowment for Democracy (NED)[27] in its report from 1998 explained that "programs to help build democracy in the former Yugoslavia since 1988, along with the Soros Foundation, NED has enabled the press, radio and TV stations to purchase equipment and supplies, including printing equipment and radio transmitters.[28] Emil Vlajki, vice-president of the Republic of Srpska, Croat, in an interview for "Pravda", according the Gazette "Geopolitika" points out: "In particular, the so-called, independent media financed by the rules, so-called, Western democracy. Those who meet the basic requirement to be with them and sell western story, will receive the money. These are branches of the U.S. propaganda outlets."[29] V. Djukanović brought the statement of James Pardew: "We are working through non-governmental organizations. We have established a ring around Serbia which used international frequencies, but we are offering that to the independent media in Serbia."[30]

Special-subversive activities culmination came in 1998 and 1999 with synchronized open armed rebellion of Albanians in Kosovo and Metohija. Assistance that the Kosovo Liberation Army (KLA) had was not only material but much broader. There were generally four types of external assistance provided to the rebels. The first was to present the rebel idea from the standpoint of moral causes as right and justified. Secondly, there was the political support and was performed within the international institutions and forums searching for the solutions that were in line with the strategic objectives of the rebels. The third form of assistance was through the provision of arms, ammunition, money, food, etc., while the fourth was a form of technical assistance in the form of training and technical support.[31] Bearing this in mind, it is clear to identify all the activities that were conducted in support of Albanians in Kosovo in the late 1990s. But the data show something quite different. "According to the official data from Serbian sources between 1 January and 30 August 1998, Albanians took 1,126 terrorist attacks in Kosovo, in the 616 cases the targets were the Serbian policeman and civilians in 510. During the attacks on Serbian police forces 74 policemen were killed and 282 were injured. In attacks on civilians, 81 persons were killed and 95 were injured."[32] Although, the U.S. State Department in 1998, ranked the KLA as the international terrorist orga-

26 Milutinović M., Propaganda i indoktrinacija Srba, Defendologija, Banja Luka, godina I, br. 3, novembar 1998, p.71; Sindler R.Dz. (2009), Nesveti terror – Bosna, Al Kaida i uspon globalnog dzihada, Službeni glasnik, Beograd, p. 155

27 This Organization of the US is financed by the Congress, and was established in 1983, to cover "dirty jobs" of the CIA all around the world – support of propaganda to subversive activities. Djukanović V., Koliko su nezavisni "nezavisni mediji", The Gazette "Geopolitika", mart 2011, p. 51

28 Djukanović V., Koliko su nezavisni "nezavisni mediji", The Gazette "Geopolitika", mart 2011, p. 51-52

29 Ibd. p. 51

30 Ibd. p. 51

31 Bandula Z.S. (decembar 1997): Sukobi niskog intenziteta, Hrvatski vojnik, p. 26

32 Vlajki E.(2007): Kosovsko raspeće Srbije, Nikola Pašić, Beograd, p. 20

nization connected with Osama Bin Laden, according to the article of Ramesh Chandram and the report of one unidentified drug official: "They were terrorists in 1998 and now, because of politics, they're freedom fighters."[33]

During negotiations at Rambouillet in February 1999, the representatives of the FRY were brought as "accredited criminals" to blackmail them and to reach the "legal" requirements for the use of force by the NATO. Two senior representatives of the U.S., George Kenney, former senior official in the Department of Yugoslavia at the Ministry of Foreign Affairs, and the United States Jimmy Jatras, foreign affairs adviser to Republican Senator in the U.S. Senate, confirmed statement of a senior official of the Ministry of Foreign Affairs on the U.S. about negotiations in Rambouillet, where he says: "We intentionally set the bar too high for the Serbs to comply. They need some bombing, and that's what they are going to get."[34] In Annex B Article 8 of this Agreement, relating to the status of the multinational force for the implementation, it states: "NATO personnel shall enjoy, together with their vehicles, vessels, aircraft, and equipment, free and unrestricted passage and unimpeded access throughout the FRY [Federal Republic of Yugoslavia] including associated airspace and territorial waters. This shall include, but not be limited to, the right of bivouac, maneuver, billet, and utilization of any areas or facilities as required for support, training, and operations."[35] In addition, Article 6 guarantees one hundred percent immunity for NATO forces in front of the FRY courts for enforcement of violations of any kind. On the basis of Article 10, the NATO is exempt from paying any fees for the use of the FRY complete necessary infrastructure. There is defined that the military commander of KFOR is the supreme authority in the territory.[36] However, the proposing agreements to FRY could not be accepted, as it would not be by any other sovereign state in the world. It had big and direct association on 1914 and the Ultimate note which Serbia had got from Austria-Hungary Empire. The Serbs did not accept because acceptance meant total capitulation and occupation of the FRY.

Starting the charges against Milosević in May 1999, there was subversive propaganda moved by the NATO and the International Court in The Hague only to justify the continuation of bombing action. Madeleine Albright said the indictment "explains the world and the public in these countries to laugh (NATO policy) is justified because of the crimes committed, and I think that will allow the continuation of this process," [37] or the bombing of Yugoslavia. This scenario was tested again in Bosnia and Herzegovina against Mladić and Karadzić, also indicted in 1995. Clearly, the President of the Court in The Hague Antonio Kasese said that "the indictment means that these gentlemen will not be able to participate in the peace negotiations."[38] This is clearly taken for granted that this is a political rather than judicial decision.

The phase of "open door"

The fourth phase - the "open door" - is underway and it includes activities focused on the degradation of Serbia and moving Serbia away from Russia. Bosnia and Herzegovina is at this stage, slowly but surely reduced to a centralist state where it tries to minimize the importance of the Republic of Srpska and create a unitary Bosnia and Herzegovina. This fourth phase or stage of the "open door" means that subversive propaganda activities, according to the needs and in accordance with the interests of the West and through "checkpoints" (non-governmental organizations, "independent media" agency, diplomatic corps, etc.), established during the second and third phases, are on the way, in this phase Serbia and the Serbs in Bosnia and Herzegovina, began to implement activities aimed to break the negative images of Serbs in the world. Successful "push" is Dick Marty's report contributing that the European Union and the world public hear another side of the story. They were all aware of the events but they ignored them because of their interests.

33 Chandran R., US-backed KLA linked to heroin network, say intelligence reports, 4 May 1999, http://www.nadir.org/nadir/initiativ/mrta/ipan51.htm, Accessed on December 28, 2012

34 What Reporters Knew About Kosovo Talks—But Didn't Tell, http://fair.org/press-release/what-reporters-knew-about-kosovo-talks8212but-didnt-tell/, 2.jun 1999, Accessed on January 12, 2013

35 Schwarz P., How the Balkan war was prepared: Rambouillet Accord foresaw the occupation of all Yugoslavia, 14 April 1999, http://www.wsws.org/en/articles/1999/04/yugo-a14.html, Accessed on January 24, 2013

36 Vlajki E.(2007): Kosovsko raspeće Srbije, Nikola Pašić, Beograd, p. 24

37 Herman S.E. & D. Peterson (2006): Milosevic's death in the propaganda system, ColdType, Chicago, p.10

38 Ibd, p.10

The White book of Serbia at the end of the 1990s contains all the relevant information about the criminal activities of Kosovo Albanians, along with pictures and a clear and complete description of the major activities of individuals and entire criminal structure throughout Kosovo and Metohija with the leaders and their clans and also the activities and relations with other clans. The White book was published on the internet and was available to everyone, but no one dared comment before Kosovo declared its independence and after it "got out of control" of the Western powers and turned into a hotbed of crime in the Balkans but also in Europe. Reports compiled in 2004 by the KFOR and the United States about criminal groups in Kosovo did not bring anything new in terms of what was already known, but there was not any reaction from either the KFOR, EULEX or the global public.

There is more different kind of pressure on Serbia. The tribunal in The Hague still has its role in the pressure on Serbia and Serbian people in Croatia and Bosnia and Herzegovina, too. Serbs were convicted every time and Bosnians, Albanians, Croats are freedom fighters and they are free after each important process. Good examples are Gotovina and Markač, Haradinai, Orić and etc. Everything is supported by the U.S. film industry. Serbs replaced Russians as bad guys in all Hollywood movies.

It is clear that subversive propaganda against Serbs and Serbia has not stopped and that it is still under relentless fight to turn into a genocidal nation and people unworthy of life in this part of Europe. It is clear from the judgment of the Serbs against the Bosnians and Croats in the war crimes court in Sarajevo. According to the Gazette "Press" Serbs were sentenced to a total of 714 years and 6 months and 77% of the judgments, the Croats were sentenced to 135 years and 6 months and 14.5% respectively Bosnians were sentenced to only 77 years and only 8.3%.[39]

CONCLUSION

Subversive activities against former Yugoslavia, FRY, Serbia and Serbs in the late 20th century and which still exist are characterized by their system, planning and structure. Ways of their realization were manifold and can be viewed through four phases. In the first phase, before the outbreak of war in Bosnia and Herzegovina, there was forming and shaping of images of the events in former Yugoslavia which created the image of Serbs as the "bad guys". In the second phase, during the war in Bosnia and Herzegovina, the image of the Serbs was sought to confirm and create a kind of stereotype. The third phase is a phase of exploitation and the negative image of the Serbs to destroy the last pillar of the Serbian people and that is dignity. The fourth phase is in progress and the current daily different pressures on Serbia and the Serbs in Vojvodina, Sandžak and southern municipalities on the border with the Serbian province of Kosovo and Metohija. This phase is possible to conduct through a variety of structures which have been tested in the second and third stages, while modern technologies allow easier and simpler operation, especially the younger population susceptible to all kinds of manipulation.

There are a very few books on Serbian tragedies of the late 20th century, indicating the various types of pressure and subversive propaganda activities that took place. Unlike the Serbs, the Faculty of Political Sciences in Sarajevo defended dozens of theses and dissertations that treat "Serb aggression", "genocide of Serbs against Bosnians", "Serbs are blamed for starting the war," and others. A large number of these books with similar titles were issued by the university. Unfortunately, very few Serbs write the books because they still believe in theory that "the truth will win". However, I am confident that the truth needs a lot to win and we have to "push" if we want its victory. Our history must be written. This is what will remain for the future generations. Also the internet is full of articles, reviews, and literature that are directed against the Serbs and Serbian struggle for the preservation of their being, the state and therefore the centuries of living space. Searching those electronic data it is much more likely to find the articles that are written by the Croats and Bosnians against the Serbs than the other way around. The number of books about our saga of Krajina and "ethnic cleansing" of Serbs from Croatia translated to one of the world's languages can be counted on the fingers of one hand.

39 The Gazette "Press", March 15, 2012, p. 2

Subversive activities have become an integral part of everyday life in Serbia and the Serbs in the last thirty years. The fight for the truth must continue to take the fight, but must be durable, comprehensive and above all must have a written record in history.

REFERENCES

1. Abazović D.M. (2002): Državna bezbjednost-uvod i temeljni pojmovi, Fakultet kriminalističkih nauka, Sarajevo
2. Dimitrijevic B., Od medijskog stereotipa do vojne intervencije, Vojno delo, 2/1999, Beograd
3. Herman S.E. & D. Peterson (2006), Milosevic's death in the propaganda system, ColdType, Chicago
4. Lopušina Marko (1997), CIA protiv Jugoslavije, Narodna knjiga, Beograd
5. Mialkovski M. (1996), Iznenađenje u subverzivnom ratu, Vojno delo, Novinsko-izdavačka ustanova „Vojska", No.2
6. Milutinovic M., Propaganda i indoktrinacija Srba, Defendologija, Banja Luka, godina I, br. 3, novembar 1998
7. Milašinović M. R. (1998): Teror zapada nad svetom, Idij, Veternik
8. Mikić S., Politička agresija, Vojno delo, 1/2001
9. Politički leksikon (1980), Savez publicista Srbije, Beograd
10. Srebrenica-falsifikovanje istorije (2012), Istorijski projekat Srebrenica, Naš pečat doo, Beograd
11. Sindler R.Dz. (2009), Nesveti terror – Bosna, Al Kaida i uspon globalnog dzihada, Sluzbeni Glasnik, Beograd
12. Tofler A. & H. Tofler (1998), Rat i antirat, Paideia, Beograd
13. Vlajki E.(2007): Kosovsko raspeće Srbije, Nikola Pašić, Beograd
14. Zivkovic N (2003), Kako nas vide drugi: slika Srba u nemačkim medijima, Prometej, Novi Sad

UDC: 006.065:[007:004

INFORMATION SECURITY MANAGEMENT SYSTEM (ISO 27001)

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Abstract: ISO/IEC 27001, part of the growing ISO/IEC 27000 family of standards, is an information security management system (ISMS) standard published in October 2005 by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). ISO/IEC 27001 formally specifies a management system that is intended to bring information security under explicit management control. Being a formal specification means that it mandates specific requirements. Organizations that claim to have adopted ISO/IEC 27001 can therefore be formally audited and certified compliant with the standard. Most organizations have a number of information security controls. However, without an information security management system (ISMS), controls tend to be somewhat disorganized and disjointed, having been implemented often as point solutions to specific situations or simply as a matter of convention. Security controls in operation typically address certain aspects of IT or data security specifically; leaving non-IT information assets (such as paperwork and proprietary knowledge) less protected on the whole. Moreover, business continuity planning and physical security may be managed quite independently of IT or information security while Human Resources practices may make little reference to the need to define and assign information security roles and responsibilities throughout the organization.

Key words : information technology, security techniques, information security management systems, requirements.

INTRODUCTION TO ISO SECURITY RELATED STANDARDS

ISO security related standards

ISO (International Organization for Standardization) and IEC (the International Electro technical Commission) form a specialized system for standardization. These organizations prepare, negotiate and publish standards which are to be followed by all member countries. National standardization organizations (i.e. National Bodies), therefore, are members of ISO and IEC, and participate in the development of international standards.

For information technology, ISO and IEC established the so called JTC 1 (Joint Technical Committee). JTC 1 members are National Bodies. Currently there are 40 participating members, 42 observing members, 14 liaison members internal to ISO and IEC and 22 external liaison members. JTC 1 is concerned with developing, maintaining, promoting and facilitating Information Technology standards required by global markets meeting business and user requirements (JTC1, 2008)[1].

Since JTC 1 standard development, according to JTC 1 mission statement, is "conducted with full attention to a strong business-like approach (e.g., cost effective, short development times, market-oriented results)" (JTC1, 2008), businesses are motivated to implement these standards, especially security related standards, as they bring compliance and stability in Information Systems also.

A business-like approach is the concept which addresses not only the technical side of Information Systems but also the human side: human resources management and organizational structure. This bond between humans and technology is described best through a comprehensive set of information security policies and procedures which represents a basic requirement of the standard.

1 Information Technology Standards JTC 1, JTC 1 at Glance; 2008,

These policies are part of a broader Information Security Controls defined as "means of managing risk, including policies, procedures, guidelines, practices or organizational structures, which can be of administrative, technical, management or legal nature". (BS ISO/IEC 27002:2005, 2008).

Only the implementation and acceptance of Information Security Controls in the organization can lead to an organizational compliance and high return on investment.

From the other side, a business-like approach is not of the utmost importance for international organizations or public sector companies, compared to profit driven organizations, since their budget is not necessarily connected to their performance. Likewise, information security is not high on the agenda. The refusal to invest in a standardization of information security is often justified by the principle of "organizational transparency" which would be inevitably undermined with extensive security.

The falseness of the above argument is exposed in this project. Furthermore, the project shows not only that the implementation of information security standard has no alternative; it also by no means disrupts organizational transparency. On the contrary, it boosts it up.

MANDATARY REQUIEMENTS FOR SERTIFICATION

ISO/IEC 27001 is written as a formalized specification such that accredited certification auditors are meant to be able to use the standard as a formal description of items that their clients must have in order to be certified compliant. It does indeed specify certain mandatory documents explicitly. However, in other areas it is more vague and, in practice, other documents are commonly demanded, including certain items which provide the auditors with evidence or proof that the ISMS is operating. The diagram below – Figure 1 (taken from the ISO27k Toolkit) shows at what stages of the typical ISO27k implementation process most of the required documents are normally produced:

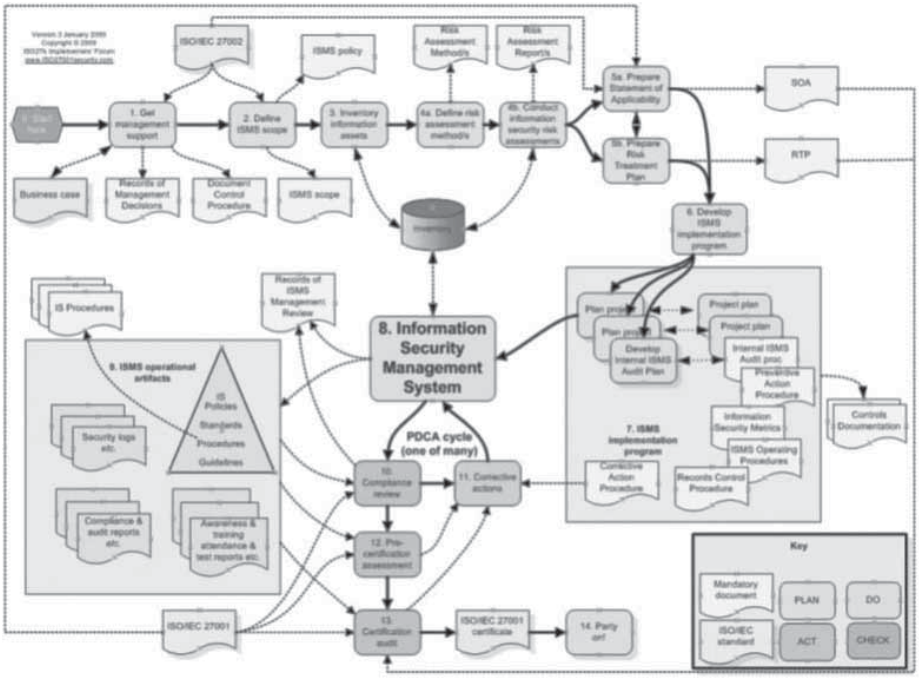

Figure 1 - ISMS implementation and certification proces

STRUCTURE AND CONTENT OF ISO/IEC 27001

ISO/IEC 27001:2005 has the following sections:

1) Introduction - the standard uses a process approach.
2) Scope - it specifies generic ISMS requirements suitable for organizations of any type, size or nature.
3) Normative references - only ISO/IEC 27002:2005 is considered absolutely essential to the use of 27001.
4) Terms and definitions - a brief, formalized glossary, soon to be superseded by ISO/IEC 27000.
5) Information security management system - the 'guts' of the standard, based on the Plan-Do-Check-Act cycle where Plan - define requirements, assess risks, decide which controls are applicable; Do - implement and operate the ISMS; Check - monitor and review the ISMS; Act - maintain and continuously improve the ISMS. It also specifies certain specific documents that are required and must be controlled, and states that records must be generated and controlled to prove the operation of the ISMS (e.g. certification audit purposes).
6) Management responsibility - management must demonstrate their commitment to the ISMS, principally by allocating adequate resources to implement and operate it.
7) Internal ISMS audits - the organization must conduct periodic internal audits to ensure the ISMS incorporates adequate controls which operate effectively.
8) Management review of the ISMS - management must review the suitability, adequacy and effectiveness of the ISMS at least once a year, assessing opportunities for improvement and the need for changes.
9) ISMS improvements - the organization must continually improve the ISMS by assessing and where necessary making changes to ensure its suitability and effectiveness, addressing nonconformance (noncompliance) and where possible preventing recurrent issues.

INFORMATION SECURITY MANAGEMENT SYSTEMS AND ITS IMPLEMENTATION

ISO/IEC 27000 FAMILY STANDARDS

ISO (International Organization for Standardization) and IEC (the International Electro technical Commission) published three Information Security related standards:

1. ISO/IEC 27001 – provides specification for ISMS with detailed guidelines on ISO/IEC 27002 implementation. The full name of the standard is: ISO/IEC 27001:2005 7799-2:2005 Information technology — Security techniques — Information security management systems — Requirements;

2. ISO/IEC 27002 – provides code of practice for information security management and is a starting point in developing ISMS. It provides a list of controls and implementation guidance. The full name of the standard is: ISO/IEC 27002:2005 7799-1:2005 Information technology — Security techniques — Code of practice for information security management;

3. ISO/IEC 27003 – ISO/IEC 27005 are designated numbers for upcoming security standards;

4. ISO/IEC 27006 – provides guidelines for the accreditation of organizations offering ISMS certification. The full name of the standard is: ISO/IEC 27006:2007 - In- formation technology — Security techniques — Requirements for bodies providing audit and certification of information security management systems[2];

1) Security Policy;
2) Organization of Information Security;

2 These standards are copyright protected and have to be purchased. ISO/IEC 27001 standard has eleven domains, addressing the most important areas of Information Security:

3) Asset Management;
4) Human Resources Security;
5) Physical and Environmental Security;
6) Communication and Operations Management;
7) Access Control;
8) Information Systems Acquisition, Development and Maintenance;
9) Information Security Incident Management;
10) Business Continuity Management;
11) Compliance (Information technology – Security techniques – Code of practice for information security management, 2008);

Defining the 134 best security practices in the ISO/IEC 27001, which covers 11 domains listed above and coupled with perpetual improvement as defined in PDCA, makes this standard one of the most comprehensive security related guidelines for building robust Security Infrastructure of the organization[3].

Achieving information security is only possible by introducing a number of controls detailed in the domains mentioned above. For example, an appropriate organizational structure with processes which are well documented, policies and procedures as well as technical functions including acceptable use of hardware and software.

PDCA CONCEPT

PDCA (Plan – Do – Check – Act) cycle is a four step model for implementing a change without end. It is a perpetual process that needs to be repeated over and over again in order to achieve continuous improvement. It was invented by Deming and it is alternatively called Deming Wheel model. Deming Wheel model is introduced to ISMS through ISO/IEC 27001, the second part (Information technology — Security techniques — Informa tion security management systems — Requirements, 2008);

Within the Information Security Management System, PDCA has its place between information security requirements and expectations as legitimate business requirements from one side and achievement of a managed information security on the other side.

ISO 27001 information security standard requires that every ISMS process should be structured by using PDCA model as seen on a figure 2 taken from ISO/IEC 27001.

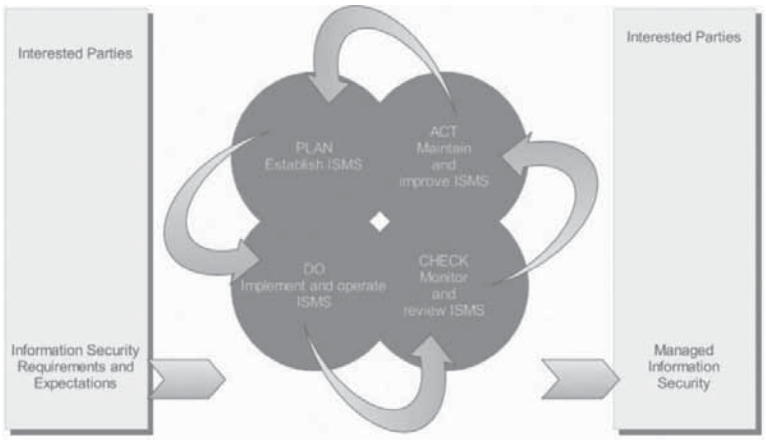

Figure 2 - ISMS PDCA model

3 Ilijazi Erzen; Develop a collection of policies and guidelines for an information security management system certification path for non-profit organizations

Standard requirements of ISMS implementation are listed below. These requirements follow PDCA concept.

PLAN:

1) Planning and preparing ISMS scope;
2) Identifying assets and performing its classification;
3) Planning and performing risk analysis;
4) Preparing risk treatment plan;
5) Preparing ISMS statement of applicability;

DO:

1) Implementing risk treatment plan;
2) Training all employees in ISMS;

CHECK:

1) Planning and performing ISMS monitoring and its annual review;

ACT:

1) Planning and performing ISMS maintenance and improvement;

Each one of the above PDCA steps should be substantiated with comprehensive ISMS documentation. The set of policies and guidelines can be found in the project appendices at the end of this dissertation.

ISMS IMPLEMENTATION

Confidentiality, availability and integrity are three core principles of information security. They represent the so called CIA triad which is shown on Figure 3:

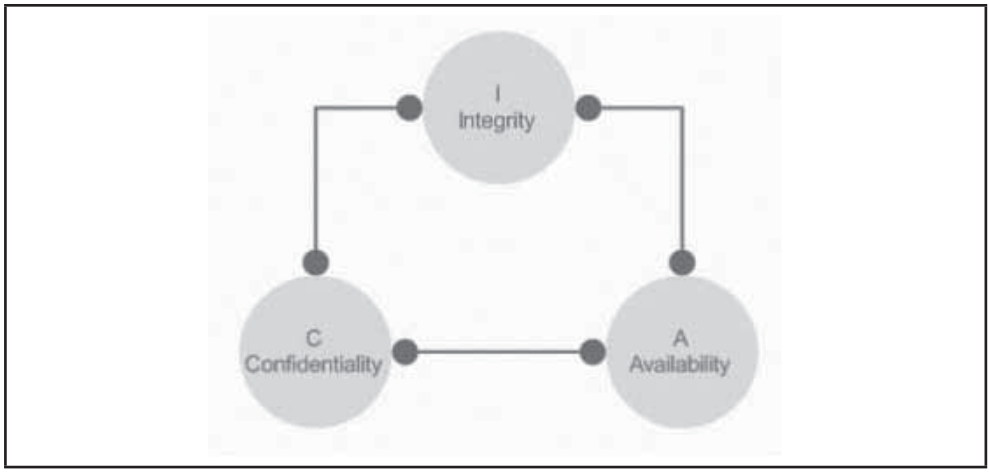

Figure 3 - CIA Triad

- Confidentiality ensures that information is accessible by authorized users;
- Integrity represents safeguarding the accuracy and completeness of information;
- Availability guarantees that authorized users have an access to information when information is required;

One of the business goals of any profit driven or non-profit organization is to ensure a high level of information security for their information assets. Information security represents protection of information by achieving acceptable levels of confidentiality, integrity and availability.

The ISMS implementation for a profit driven organization is mainly motivated by external pressure, either the clients' requirements or compliance with applicable legislation. ISMS certification reassures clients that the information assets of the company will not be compromised, altered or released, and that services provided by the company will always be available.

Unfortunately, non-profit organizations are not usually service and client oriented. Furthermore, big non-profit and international organizations do not need to comply with legislation of the host country. For these reasons, ISMS implementation in non-profit sector is mainly motivated by internal pressure, either as a recommendation of external audit or as a reaction to a serious information security incident[4].

For both profit and non-profit organizations, the management commitment is a crucial prerequisite for a successful ISMS implementation. But, it should not stop there. Management responsibility and management review as well as annual external audit gives additional steering speed to ISMS PDCA cycle, having continuous Information Security improvement as a result.

ISO 27001 DOMAINS

Asset Management Components

The asset management domain deals with analyzing and attaining the necessary level of protection of organizational assets. The typical objectives of the asset management domain is to identify and create an inventory of all assets, establish an ownership on all assets identified, establish a set of rules for the acceptable use of assets, establish a framework for classification of assets, establish an asset labeling and handling guideline. Asset management, broadly defined, refers to any system that monitors and maintains things of value to an entity or group. It may apply to both tangible assets such as buildings and to intangible concepts such as intellectual property and goodwill[5].

An asset is anything that has value to the organization. Assets can include infrastructure (e.g. buildings, store houses, towers etc.), physical assets (computer equipment, communications, utility equipment, heavy machinery), software assets (applications, software code, development tools, operational software etc.), information (database information, legal documentation, manuals, policies & procedures, organizational documents etc.), services (transport, air conditioning, communications, utilities etc.), people (management, skills, experience etc.) and imperceptible (reputation, image etc.).

Asset management is a systematic process of operating, maintaining, upgrading, and disposing of assets cost-effectively. Organizations need to identify all assets and create and maintain security controls around them. For each asset a designated owner needs to be made responsible for the implementation of appropriate security controls. When creating an asset management policy the organization needs to define the scope of the policy (which parts of the organization are covered under the policy), responsibility (who is ultimately responsible for the policy), compliance (is compliance mandatory or not, what are the guidelines to follow), wavier criteria (on what basis can someone ask for a waiver) and effective date (from when to when is the policy applicable).

Typical policy statements for Asset Management include:

- All assets shall be clearly identified, documented and regularly updated in an asset register
- All assets shall have designated owners and custodians listed in the asset register
- All assets will have the respective CIA (Confidentiality, Integrity and Availability) rating established in the asset register
- All employees shall use company assets according to the acceptable use of assets procedures
- All assets shall be classified according the asset classification guideline of the company

4 Luke Aspinall; An Introduction to Global Fund and its Governance Model
5 Information technology – Security British Standard Institute 2007

Asset management comprises of all the activities associated with ongoing management and tracking of assets some of which are as follows: asset discovery (physical & logical), create & maintain conclusive software library, create & maintain conclusive hardware stock, configuration management, physical asset tracking, software license management, request & approval process, procurement management, contract management, assessment on ISO 27001 and PCI controls, supplier/ vendor management, re-deployment & movement, retire & disposal Management, compliance with laws if applicable etc.

Asset Register

The asset register documents the assets of the company or scope in question. Typically, all business functions are required to maintain an asset register of their business units. The asset register is required to contain, at a minimum, the following information about the assets: the asset identifier, the asset name, the type and location of assets; the name of the function and process that uses this asset, the asset owner, custodian and user and the CIA (Confidentiality, Integrity, Availability) ratings of the asset. Organizations can choose to additional information into the asset register as necessary for example for IT assets can have IP address as part of them etc.

For all asset registers, a primary person responsible for the asset register needs to be identified. Typically, the business unit head or director is the owner of the asset register and recognized functional heads identified are asset custodians. The asset owner is accountable for the comprehensive protection of assets owned by him/her. The asset owner may delegate the responsibility of applying the relevant controls for the maintenance of the assets to an individual/ function referred to as the 'asset custodian'. It is the responsibility of the asset custodian to implement appropriate security controls that are required for the protection of information assets. It is the responsibility of all employees and third party staff to maintain the confidentiality, integrity and availability of the assets that they use.

Asset Classification

Assets need to be classified in order to provide an appropriate level of protection for a certain category of assets. Information assets need to be classified in terms of its value, requirements and criticality to the business operations of the company. Typical company classification guidelines follow restrictive principles. Some of the common classifications criteria which are used by companies are given below:

RESTRICTED: The restricted level of asset information pertains to highly sensitive information to the company; which when disclosed would cause substantial damage to the reputation and competitive position of the company in the market. Its unauthorized disclosure could adversely impact its business, its shareholders, its business partners and/ or its customers, leading to legal and financial repercussions and adverse public opinion. Examples of restricted information are details of major acquisitions, divestments and mergers, business and competition strategy, sensitive customer, competitor, partner or contractor assessments, intellectual property information, law enforcement and government related information.

CONFIDENTIAL: This category refers to asset information that relates to individuals or is otherwise restricted only to authorized users, but if disclosed outside the company would not harm the organization, its customers, or its partners. This classification applies to any sensitive business information which is intended for use within the company. Examples of confidential information include customer information, negotiating positions, marketing strategy, personnel information, internal company memos and presentations.

INTERNAL: This classification refers to asset information that is potentially available to all personnel within the company, but is not public. This can also include information that is restricted to a group or project within the company, but is not designated as "Private" or "Restricted." Examples of internal information include product design information, system documentation, company employee details, company organizational charts, minutes of department meetings.

PUBLIC: This classification refers to asset information that has been published or obtainable from a published source, e.g. the Internet. An example of public information includes published marketing material, company public statements or announcements, published company performance information, published job vacancies.

Asset Labeling

All important and critical assets to the company shall be labeled physically / electronically as per the information labeling and handling procedures of the company. The asset owners are required to ensure that their assets are appropriately labeled (marked) for ease of identification. This may exclude information classified as 'public'. For each classification level, the handling procedures should include the assets introduction; secure processing, storage; transmission and destruction. Classification level must be indicted wherever possible for all forms of physical / electronic information that are sensitive in nature. For example: subject of email stamped with "Confidential" etc.

Access Control

The access control domain deals with the implementation of access controls across all electronic forms of information processing systems like operating systems, applications, networks or mobile platforms. An access control is the selective restriction of access to a place or other resource. Typically, an access control policy of an organization establishes the requirement of controls that need to be implemented for controlling access to information, information processing facilities and business processes on the basis of business and security requirements. The policy should aim to control the assimilation, authorization, and dissemination of information in a controlled manner. The typical organizational objectives of the access control policy are to establish a procedure for user registration and de-registration, establish a procedure to grant the correct level of access privilege, establish a procedure to control password use, password change and password removal, establish a procedure for managements review of access rights, establish a procedure for unattended equipment, maintain a clear desk policy, establish a procedure to control network service access, establish a control method for authentication of remote users, establish a procedure for configuration ports, establish a procedure to segregate networks, establish a procedure to use precise routing controls, establish a procedure to control system utilities and to establish a procedure to secure communications over mobile computing devices.

User Registration

A registered user is one who uses an information processing facility and provides his/her credentials, effectively proving his/her identity. Generally speaking, any person can become a registered user by providing some credentials, usually in the form of a username (or email) and password. After that, one can access information and privileges unavailable to non-registered users, usually referred to simply as guests. The action of providing the proper credentials for a system is called logging in, or signing in. Without proper policies to govern a user registration, unauthorized people can gain access to confidential company information and leak it out causing harm to the organization economic status and repute. Organizations need to establish a user registration procedure which shall include controls for operating systems and applications access.

Typical policy statements can include:

- All users shall have a unique user ID based on a standard naming convention
- A formal authorization process shall be defined and followed for provisioning of user IDs.
- An audit trail shall be kept of all requests to add, modify or delete user accounts/IDs
- User accounts shall be reviewed at regular intervals
- Employees shall sign a privilege form acknowledging their access rights
- Access rights will be revoked for employees changes or leaving jobs
- Privileges shall be allocated to individuals on a 'need-to-have' basis.
- A record of all privilege accounts shall be maintained and updated on regular basis

Password Management

The password management deals with allocation, regulation and change of password rules of the organization. Organizations face significant security exposure in the course of routine IT operations. For example, dozens of system administrators may share passwords for privileged accounts

on thousands of devices. When system administrators move on, the passwords they used during their work often remain unchanged, leaving organizations vulnerable to attack by former employees and contractors.

Weak password management means that the most sensitive passwords are often the least well defended. The need to coordinate password updates among multiple people and programs makes changing the most sensitive passwords technically difficult. Inability to secure sensitive passwords exposes organizations to a variety of security exploits. Strong, manual controls over access to privileged accounts may sometimes create unanticipated risks, such as impaired service in IT operations and escalation of physical disasters from one site to an entire organization. Inability to associate administrative actions with the people who initiated them may violate internal control requirements.

Typical organizational password management policies include:

- Users shall be forced to change their passwords at the time of the first use
- Passwords shall have a minimum length of eight characters
- Passwords for all users shall expire in 30/60 days
- A record of five previous passwords shall be maintained to prevent the re-use of these passwords
- A maximum of three successive login failures shall result in a user's account being locked out
- Passwords shall not be displayed in clear text when they are being keyed in
- Passwords must include at least one small character (a-z), one capital character (A-Z) and one numeric character (0 – 9) / one special character (@ # $ & / +)
- All password entry tries shall be logged along with date, time, ip address, machine name, application and user ID for successful, unsuccessful login attempts

Clear Work Environment

The clear work environment can go a long way in securing the organizations security situation. Most important organizational documents are generally lying around on employees' desks on desktops open to privy to all individuals within the company. The main reasons for a clean desk policy are manifold including: a clean desk can produce a positive image when our customers visit the company; it reduces the threat of a security incident as confidential information will be locked away when unattended, sensitive documents left in the open can be stolen by a malicious entity.

Example of clear work environment policies include:

- Critical information shall be protected when not required for use
- Only authorized users shall use the photocopier machines
- All loose documents from the employees' desks shall be confiscated at the end of a business day
- A user's desktop shall not contain reference to any document directly or indirectly

Operating System & Application Control

If an attacker can easily view someone's username and password, he can impersonate that user, and do massive damage by modifying critical information, read corporate emails, damage corporate websites etc. The procedure to log into an operating system or application control should minimize the risk of an unauthorized access. The procedure shall, therefore, follow a strict set of rules to govern what information is displayed to the potential user during the process of log-in.

Sample operating system and application control policies include:

- All users in the organization shall have a unique ID
- No systems or application details shall be displayed before log-in
- In the condition of log-in failure, the error message shall not indicate which part of the credential is incorrect
- The number of unsuccessful log-in attempts shall be limited to 3/5/6 attempts
- During the log-in process, all password entries shall be hidden by a symbol
- The use of a system utility program shall be restricted e.g. password utility
- All operating systems and applications shall time out due to inactivity in 5/10/15/30 minutes
- All applications shall have dedicated administrative menus to control access rights of users

Network Security

Network security assumes importance to the organization when viewed in light that networks change frequently as new users and devices are added and newer data communication technologies are introduced, usage of various networking, communications, and computing technologies to effectively meet the expanding need, sensitive data is increasingly transmitted over networks, proliferation of internet access has increased the vulnerability as employees use internet more for information and knowledge.

The primary objectives of a network security policy should be to ensure that the access to the network of a company is only provided to authorized users, that adequate controls are in place to manage remote users, that all equipment can be recognized uniquely, that networks should be segregated based on needs, and that appropriate network routing protocols are enabled.

Typical policy statements for Network Security include:

- Appropriate authentication mechanisms shall be used to control the access by remote users.
- Allocation of network access rights shall be provided as per the business and security requirements
- Two-factor authentication shall be used for authenticating users using mobile/remote systems

CONCLUSION

The ISO/IEC 27000-series (also known as the 'ISMS Family of Standards' or 'ISO27k' for short) comprises information security standards published jointly by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC).

The series provides best practice recommendations on information security management, risks and controls within the context of an overall information security management system (ISMS), similar in design to management systems for quality assurance (the ISO 9000 series) and environmental protection (the ISO 14000 series).

The series is deliberately broad in scope, covering more than just privacy, confidentiality and IT or technical security issues. It is applicable to organizations of all shapes and sizes. All organizations are encouraged to assess their information security risks, then implement appropriate information security controls according to their needs, using the guidance and suggestions where relevant. Given the dynamic nature of information security, the ISMS concept incorporates continuous feedback and improvement activities, summarized by Deming's "plan-do-check-act" approach, that seeks to address changes in the threats, vulnerabilities or impacts of information security incidents.

LITERATURE

1. Information Technology Standards JTC 1, JTC 1 at Glance [Online], 2008 Available from: http://isotc.iso.org/livelink/livelink/fetch /2000/2122/327993/755080/1054033/2314809/ customview.html?func=ll&objId=2314809&objAction=browse&sort=name#mission
2. Information technology – Security techniques – Code of practice for information security management [Book], British Standard Institute 2007, ISBN 978 0 58059729 9
3. Ilijazi Erzen; Develop a collection of policies and guidelines for an information security management system certification path for non-profit organizations (ISO270001) [Disertation] – The Universiti of Liverpool – Master of science information systems management 2008,
4. Information technology — Security techniques — Information security management systems — Requirements [Book], British Standard Institute 2007, ISBN 0 580 46781 3
5. Information technology – Security techniques – Requirements for bodies providing audit and certification of information security management systems [Book], British Standard Institute 2007, ISBN 978 0 580 50311 5
6. Luke Aspinall; An Introduction to Global Fund and its Governance Model [Online], 2007
7. Available from: http://www.cgiar.org/pdf/alignment_forum_exco12_global_fund.pdf
8. The Information Security Institute of Quebec [Online] Understanding Information Security,2008 Available from: https://www.isiq.ca/en/Documents/saisir_securite_EN.pdf

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RESEARCH ON THE CONSTRUCTION OF SERVICE-ORIENTED PUBLIC SECURITY ADMINISTRATION

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Abstract: The construction of service-oriented government is the model of government introduced by the administration reform in China. As an important administrative organ of the government, the public security organs need to initiate the administrative function from the former administrative way to the present service-oriented ideal. Police officers should make it their priority to put their hearts and souls into the public service. The public security organs should accelerate the system reforms, advance the reforms of administrative functions, and conduct the concept of serving the people in their routine jobs in order to construct a better, efficient, honest and service-oriented system. The paper elaborates the functions and aims of public security service, the great role of the masses in the service-oriented police administration, and the measures to set up the service function within the public security organs.

Keywords: public security organs, service function, service-oriented, administration.

INTRODUCTION

Since the 1990s, with the drive of theory and practice, the construction of service-type government has become an important orientation of the Chinese public administration reform. The rapid development of economy and society urges the government to change from the traditional administration-oriented management to the modern service-oriented management pattern. As an important part of the government, the public security organs should explore the new service management system so as to provide better service for the public. The detailed and most important research on the construction of service-oriented public security organs dated from 2000. As the national public security administrative power and judicial power, the public security organs assume responsibilities of consolidating the state power, safeguarding national stability and guarantee the peaceful work and harmonious life of the public. The public security organs should actively adapt to the need of market economy development, play the role of criminal justice, and create a safe and stable social environment for the economic development. At the same time, they should reform and strengthen administrative management in order to promote the coordinative development of economy, create a harmonious society based on "public-oriented", and strive to construct satisfactory service-oriented organs. Whether the public are satisfied should be a standard to measure the efficiency of public security administration. [1]

"To serve the people" was first proposed by Comrade Mao Zedong at a memorial meeting for Comrade Zhang Si-de, held by departments directly under the Central Committee of the Communist Party of China in 1944. In addition, according to the instructions of General Secretary Hu Jintao at the twentieth National Conference of the public security representatives (2003): the public security organs shall adhere to the unity of the dictatorship, management function and service function. They should constantly safeguard and realize the fundamental interests of the people and put that as the starting point and impact point. At the closing ceremony and meeting with the Chinese and foreign press of the 18th session of the Standing Committee of the Political Bureau (2012), the new general secretary of the CPC Central Committee Xi Jinping mentioned the word "people" 19 times in total and emphasized that to meet people's pursuit for a happy life is the main mission for the Party. With the specific function positioning, in order to represent the interests of the people and achieve the goal, the public security organs should further promote the service-oriented construction and perfect the service function.

China has made a sound probe of constructing service-oriented public security administration. After consulting some documents, the paper gives a systematic research on the construction

1 Wu Jianqing. On the Construction of Public Service-oriented Public Security Administration. Social Science Review, 2007 (10)

of service-oriented public security administration, including the connotation of the public service function, aims of service function, role of the masses, and measures to perfect the current service function in public security organs.

CONNOTATION OF THE PUBLIC SECURITY SERVICE FUNCTION

The police service mode was proposed as a policing thought in the 1960s in the western countries. It was the main content of the fourth policing reform. The basic feature is to take service as the goal and the police work shifts from the traditional management to the higher level of service and work entirely in the people's interests. It is the masses that the police rely on to deter and suppress crimes and then gradually to achieve a virtuous circle of the social security. To promote service-oriented policing, it is not merely to make the masses of people involved in policing activities, at the same time the relationship between the police and the public is directing at a harmonious development. The pattern of police service is to uphold the service concept, help the common people unconditionally, and keep in mind the spirit of serving the people so that the police could carry out their duties timely and effectively and the police organs could play their functions and performances smoothly.

On one hand, serving the people is the common goal of both the public security organs and the police officers. On the other hand, it is the primary duty of the public security organs. To be specific, serving the people is the occupation activities and public welfare work for the police officers to serve the economic construction and meet the public demands. This is what we usually assume the narrow sense of the public security organs service function, such as 110 alarm service and community policing.

The theory basis of constructing the public security administration is the "New Public Service". It refers to the role the public administration plays in citizen-centered governance system. [2]

In the new economic era, the service request for the public security organs should keep pace with the times and reforms according to the changes of the new era. The police agencies must examine the connotation of the service function of public security organs from a developing perspective and add new concept to the service function. The goal is to serve the public, maintain the public peace, and make the masses satisfied. Service consciousness should be promoted and livelihood problems should be focused. The traditional working model should be reformed and adjusted so that a new public security administration mode could be constructed. It could provide public safety service and represent efficient democratic organization structure. [3]

AIMS OF SERVICE FUNCTION OF THE PUBLIC SECURITY ORGANS

The aim of performing service function is to establish service philosophy consciousness in the public security organs. Firstly, the basic guidelines are people-oriented and enforcement law for the public. The guidelines require the public security organs to take serving the public and responsible for the people as the focus of their jobs. Meanwhile the socialist government also regards serving the people as the main function and basic foundation of the government. The power of the government comes from the public. The public security organs need to establish the firm concept of civil rights standards of the public and obligation standards for the police so to achieve the role transformation from management to servants.

Service-oriented public security administrative system contains "people-oriented" ideology, namely the public security personnel provide the service model according to the needs of the public.

2 Qi Yaqing, Jiao Weiquan. On the Construction of Service-oriented Public Security Administration—— Based on the Theory of New Public Service. Journal of Hebei Vocational College of Public Security Police, 2009 (4)

3 Xiao Fei. Perspective on the Theories of Service-oriented Policing. Jilin Higher Public Security College, 2008 (2)

The public security personnel need to overcome the "official standard" thought and recognize the needs of the citizen as the basis of behavior. [4]

The second goal is to serve the public wholeheartedly. To conduct the service function of the public security organs embodies the aim of serving the people. It is also the inevitable choice of implementing the scientific outlook on development. The requirement for the majority of public security personnel is to adapt to the new development, and provide good service for the public in the economic construction. The police force should also firmly establish the civil rights standards philosophy so as to meet and realize the fundamental interests of the masses. The police should put the masses' needs at heart and rely on the masses to perform duties.

Moreover, in establishing the service work, the public security organs need to comply strictly with a work ethic: administration pursuant to law. The public security organs must take the law as the basis of work and take the law as the service principle. Every law should be conducted and every duty should be performed according to laws. The lawful administrative consciousness should be strengthened by the police personnel. The police should not perform beyond the power in order to set up authority and prestige among the masses. The public security organs should boost the administration according to law, adhere to fair law enforcement, and effectively safeguard social fairness and justice. The public security organs should also protect the legitimate rights and interests of citizens, ensure smooth operating of government and police orders, and finally maintain the image of the Communist Party and the government.

THE GREAT ROLE OF THE MASSES IN THE SERVICE-ORIENTED PUBLIC SECURITY ADMINISTRATION

The masses are the source of solving practical problems and improving the overall quality of the police force. The society is like a big stage and the masses are a large group. Everyone is one part of the big collective and we learn from and help each other. So the police force is not an exception. Everything has its own advantages and disadvantages. The police career also has its weaknesses and strengths. Wearing police uniforms does not mean you are superior or know everything thoroughly in the world. The uniform means a lot of responsibilities and service for the public. The name of police is not a privilege but a profession, a law enforcement agency and also a department to provide service for the public. For the police officers, they should not just concern about the personal interest or the short-term interest, but direct at the long-term interests and do more practical things for the masses. The enthusiasm could help the masses to promote a closer relationship with the masses just like the fish and water. No one can exist without the other. The police officers may encounter various troubles and problems in their routine work. But as long as they keep in mind and constantly carry forward the service spirit, problems will readily be solved. When the police gain trust and love from the masses in the law enforcement process, the problems will not be obstacles but bridges between the police and the masses. The public will become partners, assistants, even good mentors to provide continuous help for the police.

The masses are the priority of the service administration of public security organs. The close tie between the police and the masses not only refers to the service provided from the public to the police, but also includes the concept of providing service to the masses at all times. Therefore, in the policing reform, the police put property safety and practical interests of the public in the first place. The premises for serving the public should be education background, physical fitness, psychological quality and professional knowledge. But these basic skills are not enough for the police career. The police must have passion for serving the public, dedication to the job, and enjoyment of mutual benefits with the masses so that we can achieve social stability and peaceful life for the people. In the policing work the police need to put the people's interests in the first place, grant whatever is requested. In the process of law enforcement the police must communicate further with the public and get their feedbacks and gradually improve their occupation accomplishment and maintain a high-visibility presence among the masses. The public security organs should create their own image by providing service for the public. All the police personnel should take the people's interest into account in their

4 Han Chunmei, Zhan Wei. Some Speculations on Strengthening Chinese Public Security Administration System in Service. Journal of Yunnan Police Academy. 2007(4)

job. Therefore the police force in China may become firmly political-based and business proficient. They have a fine style and impartial enforcement.

The service-oriented public security administration highlights the administrative concept of serving the people with heart and soul. In essence, the idea is to maintain the social stability and strengthen the relationship between the police and the public, and thus to promote the healthy development of a harmonious society.[5]

MEASURES TO SET UP SERVICE FUNCTION IN THE PUBLIC SECURITY ORGANS

At present, how to construct the service function in the public security organs has become a hot issue across the country. The transitional function of the government from traditional mode to modern mode urges the public security organs to reform and innovate to perform the service functions well and create satisfactory police agencies.

Firstly, the majority of police personnel need to renew their old ideas and establish the idea of serving the people, and strengthen the sense of responsibility. The basic principle to construct service-oriented public security organs is that law enforcement is the prerequisite to the interests of the people, and the establishment of the police is to maintain the public interests. In order to establish the modern service policing model, the public security organs must transform from control and administration model. The police agencies should adhere to the people-oriented concept, and try their utmost to achieve and safeguard the fundamental interests of the people. In the work of public security, the idea that the interests of the people are no trifles should be conducted in three aspects. The first method is to strengthen the service window, changing from optional service to normative service. The normative service includes the standard window logo, formulating the service standards, and making the administrative procedures public. The police agencies should adhere to lawful administration, set the service contents to meet the need of the public, and establish efficient service mechanism. The second way is to broaden the service channels, changing from passive service to active service. The police should offer help to the main economic bodies and to resolve difficulties and troubles for the masses. The third approach is to reform the examination and approval system, changing from restricted management to service administration. Releasing of online information from the police agencies could help the people to fulfill the procedure of household registration or ID card more easily. The basic principle for the public security organs is to serve the masses wholeheartedly. The public security authorities have the responsibility to respond to the basic requirements of the society and the masses, and take active measures to make the public security work reflect the wishes of the people and meet the needs of the people in every aspect and every link of the work. This is the best embodiment of serving the people.

Secondly, the public security organs shall carefully perform their administrative duties, strengthen and broaden the service function of the police. The main focus presently is to build a public security force that could adapt to the development of the current economy. The main function of the government is public service. In China, although the current policies and regulations have not given a definite boundary of the service function for the public security organs, the basic requirement should include providing convenience for the masses. In the United States, the police enforcement function and service function often overlap. All local police agencies provide some services unrelated to crime control, such as emergence assistance, certificates or licensure, providing information, settlement of domestic disputes, and dealing with lost and found property. Therefore, the public security authorities of China should increase the endeavors to study politics and professions, enhance team cooperation consciousness, and strengthen skills, physical fitness and fighting ability. The public security administrative management has shown broad trends and the public rely on the police stronger than ever before. The police service field is becoming wider and wider. This requires the police to deepen and expand the service contents in order to meet the living needs of the masses. In some police stations, the police officers provide renting umbrellas free of charge in rainy days and offer hot tea or other drinks in cold days. The concept of community policing is car-

5 Tian Juan. Review of Setting up Service Type Police Administration System in China. Journal of Liaoning Police Academy. 2010 (2)

ried out in most countries. The police officers are assigned in a designated precinct. In this way the police may have a better communication with the local people and this may help the police to deal with problems. The more the police approach to the public, the sooner the problem could be solved with the cooperation of the local citizens.

The third aspect is to improve the construction of the policing operation mechanism, performance assessment system and supervision system so as to increase the service quality of the public security organs and establish green, efficient and unbiased police service administration. In the establishment of policing operation mechanism, the principle is to maximize the efficiency and it may contribute to the enhancement of the public security control ability. During the process the police agencies should overcome blindness and improve work efficiency and service quality, to achieve the maximum efficiency of the administrative work. Public security policing should be constantly adjusted and perfected. Police resources should get reasonable configuration and scientific management. Inefficient policing should be avoided. The police agencies should deepen system reform, improve efficiency, establish long-term mechanism, and constantly improve the system security, personnel security and organization guarantee. Talents should be selected and introduced into the police personnel to enrich the posts of public security business.

The evaluation and supervision systems of the police performance are carried out by the satisfaction of the masses. The satisfaction of the people will be the core value standard for the police administration. The masses may be required to evaluate the performance of the public security organs so that the latter may truly serve the massed and the service-oriented administration may become legalized and standardized. For the public, they are entitled to the right not only to enjoy the service from the police, but also to supervise the police administration by law. The police agencies should publicize the complaint phone number and the mailbox to accept the broad supervision from the masses. Simultaneously the police need to constantly update the ideas and reform mechanism to meet the needs of the masses with the continuous changes.

To enhance the quality of policing is one must way to build service-oriented police organs. High quality police personnel refer to those who not only have a high professional quality, but also have high political quality and a strong sense of serving the people. The training of professional service skills should also be strengthened. During the process of recruitment, promotion and transfer trainings, basic skills and service skills should both be taken into account. The police officers must master verbal communication skills, basic service methods and language standards in order to improve the service level.

During the new historical period, the public security organs need to complete the missions of changing the mode of management, including the following changes: positioning functions, from management to service; enforcement of power, from Almighty to limited; management methods, from approval to management type; management body, from monopoly to participation; and so as to build service-oriented public security administration mode. [6]

CONCLUSION

The police officers should always remember to put their hearts and souls into serving the people. It is the core concept for the police. The police should also apply the scientific outlook of development thoroughly and adhere to the strict enforcement of the law, pay more attention to the focus and show more passion for serving the people, and effectively maintain social justice and righteousness. Internal supervision and external supervision should be established for the public security organs. They should form a mutual promotion of supervision mechanism. The police should have a fair attitude towards the supervision from the society, especially supervision form the press. The public could supervise the all-round law enforcement and from different perspectives to ensure the fair and civilized law enforcement.

In order to contribute to the development of the service-oriented police administration, the police agencies and police officers need to make great efforts. At the same time the masses should

6 Zhan Wei, Zhu Yunyun. On the Construction of Public Security Administration Mode of Service in China — Enlightenment on Contemporary British Policing Reform for China. Journal of Chinese People's Public Security University (Social Sciences Edition). 2006 (3)

get involved and offer support. So long as we have the people's support, we can effectively promote the development of the modern service-oriented police administration. Only by serving the people from the beginning to the end could we make the closer contact between the police and the public.

The aim of this research is to give the public security organs some directions to the current service-oriented mode administration. The research focuses on theories, while the important role of service-oriented administration is to solve practical problems in executing public security tasks. Therefore, the service-oriented research is still in its initial stage, and many problems need to be solved. The academic circle only gives a general research of the service-oriented concept. Because of different circumstances, service-oriented public security organs should also show different characteristics in different regions.

Theory is based on practice and in turn serves practice. Hopefully the research may be more practical and operable. In applying the theoretical research results to the public security work, the practice of public security work also contributes to the development of scientific and normative theory research, and thus promotes the construction of service-oriented public security administration.

REFERENCES

1. Charles R. Swanson, Leonard Territo, Robert W. Taylor. Police Administration, Structures, Processes and Behavior. Prentice Hall, 2004
2. Han Chunmei, Zhan Wei. Some Speculations on Strengthening Chinese Public Security Administration System in Service. Journal of Yunnan Police Academy. 2007(4)
3. Qi Yaqing, Jiao Weiquan. On the Construction of Service-oriented Public Security Administration—— Based on the Theory of New Public Service. Journal of Hebei Vocational College of Public Security Police, 2009 (4)
4. Tian Juan. Review of Setting up Service Type Police Administration System in China. Journal of Liaoning Police Academy. 2010 (2)
5. Wu Jianqing. On the Construction of Public Service-oriented Public Security Administration. Social Science Review, 2007 (10)
6. Xiao Fei. Perspective on the Theories of Service-oriented Policing. Jilin Higher Public Security College, 2008 (2)
7. Zhan Wei, Zhu Yunyun. On the Construction of Public Security Administration Mode of Service in China — Enlightenment on Contemporary British Policing Reform for China. Journal of Chinese People's Public Security University (Social Sciences Edition). 2006 (3)
8. Zhao Liang. On the Construction of Service-oriented Public Security Administration. Jilin University. 2008(10)

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