

MEĐUNARODNI NAUČNI SKUP „DANI ARČIBALDA RAJSA“  
TEMATSKI ZBORNIK RADOVA MEĐUNARODNOG ZNAČAJA

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



MEĐUNARODNI NAUČNI SKUP  
INTERNATIONAL SCIENTIFIC CONFERENCE

**„DANI ARČIBALDA RAJSA“**  
**“ARCHIBALD REISS DAYS”**

*Beograd, 3-4. mart 2014.*  
*Belgrade, 3-4 March 2014*

**TEMATSKI ZBORNIK RADOVA**  
**MEĐUNARODNOG ZNAČAJA**

**THEMATIC CONFERENCE PROCEEDINGS**  
**OF INTERNATIONAL SIGNIFICANCE**

**TOM I**  
**VOLUME I**

KRIMINALISTIČKO-POLICIJSKA AKADEMIJA  
NEMAČKA FONDACIJA ZA MEĐUNARODNU PRAVNU SARADNJU (IRZ)  
Beograd, 2014

ACADEMY OF CRIMINALISTIC AND POLICE STUDIES  
GERMAN FOUNDATION FOR INTERNATIONAL LEGAL COOPERATION (IRZ)  
Belgrade, 2014

*Publishers*

ACADEMY OF CRIMINALISTIC AND POLICE STUDIES  
196 Cara Dušana Street, Zemun, Belgrade  
GERMAN FOUNDATION FOR INTERNATIONAL LEGAL COOPERATION (IRZ)  
Bonn, Germany

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*Computer Design*

GORAN GRBIĆ

*Impression*

200 copies

*Print*

ArtGrbić Illustrated Studio, Belgrade

THE CONFERENCE AND THE PUBLISHING OF PROCEEDINGS WERE SUPPORTED  
BY THE MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGICAL  
DEVELOPMENT OF THE REPUBLIC OF SERBIA AND GERMAN FOUNDATION  
FOR INTERNATIONAL LEGAL COOPERATION (IRZ)

© 2014 Academy of Criminalistic and Police Studies, Belgrade  
German Foundation for International Legal Cooperation (IRZ)

ISBN 978-86-7020-190-3

ISBN 978-86-7020-278-8

*Izdavači*  
KRIMINALISTIČKO-POLICIJSKA AKADEMIJA  
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*Tehničko uređenje*  
GORAN GRBIĆ

*Tiraž*  
200 primeraka

*Štampa*  
ArtGrbić Illustrated Studio, Beograd

ODRŽAVANJE SKUPA I ŠTAMPANJE OVOG ZBORNIKA PODRŽALO JE  
MINISTARSTVO PROSVETE, NAUKE I TEHNOLOŠKOG  
RAZVOJA REPUBLIKE SRBIJE  
I NEMAČKA FONDACIJA ZA MEĐUNARODNU PRAVNU SARADNJU (IRZ)

© 2014 Kriminalističko-policijska akademija, Beograd  
Nemačka fondacija za međunarodnu pravnu saradnju (IRZ)

ISBN 978-86-7020-190-3  
ISBN 978-86-7020-278-8

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## P R E F A C E

*Dear readers,*

In front of you is the Thematic Collection of Papers presented at the International Scientific Conference “Archibald Reiss Days”, which was organized by the Academy of Criminalistic and Police Studies in Belgrade, in co-operation with the IRZ Foundation from Bonn, Germany, the Ministry of Interior and the Ministry of Education, Science and Technological Development of the Republic of Serbia, China Criminal Police University, Lviv State University of Internal Affairs, Volgograd Academy of the Russian Internal Affairs Ministry, Faculty of Security in Skopje, Faculty of Criminal Justice and Security in Ljubljana, Police Academy “Alexandru Ioan Cuza” in Bucharest, Academy of Police Force in Bratislava and Police College in Banjaluka, and held at the Academy of Criminalistic and Police Studies, on 3 and 4 March 2014.

International Scientific Conference “Archibald Reiss Days” is organized for the fourth time in a row, in memory of the founder and director of the first modern higher police school in Serbia, Rodolphe Archibald Reiss, PhD, after whom the Conference was named.

The Thematic Collection of Papers contains 130 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 Germany, Russia, Ukraine, Belarus, China, Poland, Slovakia, Moldova, Lithuania, Latvia, Czech Republic, Hungary, Slovenia, Macedonia, Bosnia and Herzegovina, Croatia, Montenegro, Republic of Srpska and Serbia. Each paper has been reviewed by two reviewers, international experts competent for the field to which the paper is related, and the Thematic Conference Proceedings in whole has been reviewed by five competent international reviewers.

The papers published in the Thematic Collection of Papers contain the overview of contemporary trends in the development of police education system, development of the police and contemporary security, criminalistic and forensic concepts. Furthermore, they provide us with the analysis of the rule of law activities in crime suppression, situation and trends in the above-mentioned fields, as well as suggestions on how to systematically deal with these issues. The Collection of Papers 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 Collection contributes to improving of mutual cooperation between educational, scientific and expert institutions at national, regional and international level.

The Thematic Collection of Papers “Archibald Reiss Days”, according to the Rules of procedure and way of evaluation and quantitative expression of scientific results of researchers, passed by the National Council for Scientific and Technological Development of the Republic of Serbia, as scientific publication, meets the criteria for obtaining the status of thematic collection of papers of international importance.

Finally, we wish to extend our gratitude to all the authors and participants at the Conference, as well as to all those who contributed to or supported the Conference and publishing of this Collection, especially to the IRZ Foundation from Bonn, the Ministry of Interior of the Republic of Serbia and the Ministry of Education, Science and Technological Development of the Republic of Serbia.

Belgrade, March 2014

*Programme and Organizing Committees*



## **A WORD FROM THE IRZ**

What is IRZ and why does it support the International Scientific Conference “Archibald Reiss Days“ of the Academy of Criminalistic and Police Studies of the Republic of Serbia?

The abbreviation IRZ stands for the German Foundation for International Legal Cooperation, which was founded over 20 years ago, namely in 1992, on the initiative of the German Federal Ministry of Justice. The IRZ's task is to provide support to the partner countries in the establishment and strengthening of the rule of law. In this regard, it is very helpful that it has been organized as an association. The IRZ members are large organizations in the field of law in Germany, such as the Association of Judges, bar associations, chambers of notaries, specifically the existing Lawyers' Association and Chamber of Notaries, Women Lawyers Association and Association of Jurors, to name a few of them. Consequently, the IRZ, as the only active organization, authorized the German Federal Government, and specialized exclusively in the international counseling in the field of law, has direct access to expert knowledge and the experts from these organizations.

At first, the partner countries were exclusively from East and Southeast Europe, which have reformed their legal systems from socialism to a market democracy. Today, the IRZ also operates in North Africa and Asia. Within its work, the IRZ provides consulting services in legislative procedures and provides support in the areas of education and further training of legal practitioners, and is also the co-editor of legal publications. The IRZ is funded by the German tax funds from the budget of the Federal Ministry of Justice and the Federal Ministry of Foreign Affairs, as well as from revenues generated through participation in the IPA and twinning projects.

The IRZ has been present in Serbia since 2000, as a part of the German contribution to the Stability Pact for South East Europe. Since then, in cooperation with numerous project partners, it has implemented a number of programmes - to highlight just a few - cooperation with the Constitutional Court of the Republic of Serbia, where the IRZ significantly contributed to the introduction of individual constitutional complaint in the Serbian legal system, as well as with the Judicial Academy.

Another focus of the work in the last few years was counseling in the field of the reform of the Code of Criminal Procedure. Within the activities related to the counseling, among other things, translation of the German Guidelines for Criminal Investigation and Administrative Fines Proceedings (RiStBV) was published, which governs the basic practical issues relating to the investigative procedure. In addition, a new edition of the translation of the German Code of Criminal Procedure, developed within the IRZ's project work in Bosnia and Herzegovina, was published, in order to allow Serbian lawyers who do not speak German language to independently read the relevant German regulations.

However, it must be emphasized that the counseling within the reform of the Serbian Criminal Procedure Code, from the IRZ's perspective, did not go without disappointments. German experts particularly considered that it was inadequate for a country located in the very heart of Europe to take over institutes from criminal proceedings of the United States of America. Moreover, mixing of continental European and Anglo-American legal institutions in a hybrid law faced general challenging from a technical standpoint. Regardless of that, the IRZ continues to support the reform of the Code of Criminal Procedure in the area where the current law in Serbia is similar to the German system - in the area of investigative procedure. This can be seen also as a contribution of Germany in crime suppression in Serbia. The very focusing on the new prosecutorial investigation, especially on the cooperation between the prosecution and the police, is the reason why the IRZ cooperates in this area with the Academy of Criminalistic and Police Studies, through organization of joint events and seminars. For the same reason, the IRZ supports this scientific conference, since its goal is the strengthening of the capacities for crime prevention and investigation in criminal proceedings.

We especially greet the fact that the materials from this scientific conference will be published in printed form, which will make them available to a wider audience. An additional favorable fact is that this scientific conference pays tribute to Archibald Reiss, after whom the conference was named, as a Swiss man from German speaking region, who can also be considered as a symbol of cooperation between jurists from German speaking countries and their Serbian colleagues.

Finally, we wish to thank the many individuals and institutions, without which cooperation between the IRZ and the Academy would not be that successful and enjoyable. In the first place, we must point out the German Federal Ministry of Justice and Consumer Protection and the German Ministry of Foreign Affairs, which support and enable the IRZ's work in Serbia from the funds of German contribution to the Stability Pact for South East Europe. In addition, we would like to thank the German Ambassador Mr Heinz Wilhelm and his associates, who are closely following and constructively supporting the work of the IRZ. Finally, the IRZ would like to sincerely thank the Dean of the Academy, Mr Goran Milošević, PhD, and Vice Dean for Science and Research, Mrs Dragana Kolarić, LLD, for the efficient and always pleasant cooperation. We also thank to all those who strongly support the IRZ's counseling of Serbia in the field of investigative procedure - especially to retired Prosecutor-General Jürgen Dehn and Police Director Hans Dieter Hilken, who as an experienced team of practitioners have been sharing their rich experience in the field of prosecutorial investigation with their Serbian colleagues. We also thank Mr Dragan Simić, who has been following the activities of the aforementioned experts as a professional translator, as well as my colleague Ms Dragana Radosavljević, who as a project manager from Bonn is in charge for the IRZ's activities in Serbia.

Lawyer dr. Stefan Pürner  
Head of Section South-East Europe Middle,  
IRZ

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**TOPIC**

**INNOVATION AND STANDARDIZATION OF CRIMINALISTIC  
AND FORENSIC METHODS**

**INOVACIJA I STANDARDIZACIJA KRIMINALISTICKO –  
– FORENZICKIH METODA SUPROTSTAVLJANJA KRIMINALU**



## DETERMINATION OF GAMMA-HYDROXYBUTYRIC ACID IN HUMAN URINE WITH PRE-COLUMN DERIVATIZATION BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY-ULTRAVIOLET DETECTION

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**Abstract:** A method of analysis of gamma-hydroxybutyric acid (GHB) in human urine was presented with pre-column derivatization by high performance liquid chromatography-ultraviolet detection. The optimal pre-column derivatization conditions were as follows: briefly, 0.5 mL of human urine sample was added 0.050 mL 0.2 M NaOH solutions and 0.5 mL acetonitrile, respectively, and the mixture was then vortex-mixed and centrifuged at 5000 rpm for 5 min. 50 $\mu$ L of the supernatant was derivated in 60 $^{\circ}$ C water for 30 min by using 2-bromoacetophenone as derivative reagent and tetrabutyl ammonium bromide as activator. The derivative product was filtered through a 0.45  $\mu$ m membrane, and then directly analyzed by high performance liquid chromatography-ultraviolet detection. The experimental results demonstrated good calibration curves linearity in the range of 0.50  $\mu$ g/mL-250.0  $\mu$ g/mL and the limit of detection was 0.25  $\mu$ g/mL with pre-column derivatization and high performance liquid chromatography-ultraviolet detection of GHB in human urine. The results show high accuracy, good precision and sensitivity, and it can be widely applied in the identification of GHB in samples and in various caseworks. **Keywords:** forensic toxicology; gamma-hydroxybutyric acid; liquid chromatography-ultraviolet detection; urine; drug

### INTRODUCTION

As an endogenous metabolite of gamma-hydroxybutyrate in most mammalian tissues, gamma-aminobutyric acid (4-Hydroxybutanoic acid, GHB) has been used clinically as an intravenous anaesthetic and as a treatment for narcolepsy, alcoholism and opiate withdrawal since the 1960s. Over the last few years, GHB has been gained popularity amongst club-goers as a recreational drug (liquid ecstasy), where it is taken for its ability to produce feelings of euphoria and to enhance sexuality<sup>1</sup>. As a result, determination of GHB has become a part of routine analysis in many forensic toxicology laboratories conducting drug facilitated sexual assault casework<sup>2</sup>. Several methods including GC<sup>3</sup>, GC-MS<sup>4</sup>, HPLC<sup>5</sup>, LC-MS<sup>6</sup> and capillary electrophoresis (CE)<sup>7</sup> have been developed and are being used for the detection of GHB in blood and urine samples submitted in casework.

1 Meng P J. Review of the analysis of  $\gamma$ -hydroxybutyric acid. *J.China People's Public Security Univ.: Nat.Sci.*, 2008, 2: 11-17.

2 Ye F, Dong F W. Review of the analysis research of GHB and its precursors. *Commodity and Quantity*, 2011, 3: 156-157.

3 Letteri J T, Fung H. Evaluation and development of gas chromatographic procedures for the determination of g-hydroxybutyric acid and g-butyrolactone in plasma. *Biochem. Med.*, 1978, 20: 70-80.

4 Zhang S Y, Lin Y Z, Ke H W, Peng Y R, Huang Z R. Determination of  $\gamma$ -hydroxybutyric acid in urine by GC-MS. *Anal. Instrument*, 2005, 2: 24-27.

5 de Vriendt CA, van Sassenbroeck DK, Rosseel MT, van de Velde EJ, Verstraete AG, Vander Heyden Y, Belpaire FM. Development and validation of a high-performance liquid chromatographic method for the determination of gamma-hydroxybutyric acid in rat plasma. *J. Chromatogr. B Biomed. Sci. Appl.*, 2001, 752 (1): 85-90.

6 Chen X G, Ma S X, Ma X Z, Dang B, Liu C. Determination of gamma-hydroxybutyric acid in urine by liquid chromatography-mass spectrometry. *Guangdong Chem. Indu.*, 2013, 40: 17-18.

7 Johan Dahle 'n, Thyrsa Vriesman. Simultaneous analysis of g-hydroxybutyric acid, g-butyrolactone, and 1, 4-butanediol by micellar electrokinetic chromatography. *Forensic Sci. Int.*, 2002, 125: 113-119.

Based on the corresponding research, a method of analysis of GHB in human urine is presented with pre-column derivatization by high performance liquid chromatography-ultraviolet detection (HPLC-UVD). In this method, 2-bromoacetophenone was used as derivative reagent and tetrabutyl ammonium bromide as activator, the derivative of GHB in human urine was directly analyzed by HPLC-UVD, the results has shown many advantages in the identification of GHB in corresponding case.

## Experimental

### Chemicals and reagent

The sodium-salt of gamma-hydroxybutyric acid at a concentration of 1 g/L in methanol was purchased from Ceriliant (USA); chromatography grade methanol and acetonitrile were purchased from Shield Co., Ltd (Tianjin, China). Analytical grade 2-bromoacetophenone and tetrabutyl ammonium bromide were purchased from Sinopharm Chemical Reagent Co., Ltd (Shenyang, China).

### Liquid chromatography

The liquid chromatography analysis was performed using HITACHI-655 high-performance liquid chromatography equipped with HITACHI-550 ultraviolet detector, and a Thermo Gold ODS column (150 mm×4.6 mm, 5 μm) was used as the separation column, the mobile phase was methanol with water (48:52) at 1.0 mL/min, and the UV detection wavelength was 245 nm while the injection volume of sample was 10 μL.

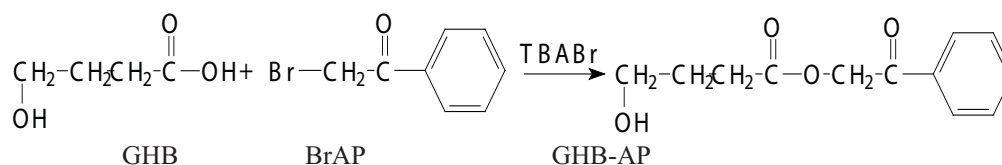
### Sample procedure

0.5 mL of human urine sample was added 0.050 mL 0.2 M NaOH solutions and 0.5 mL acetonitrile, respectively, and the mixture was then vortex-mixed and centrifuged at 5000 rpm for 5 min. 50 μL of the supernatant was derivated in 60°C water for 30 min after adding certain amount of 2-bromoacetophenone solution, as derivative reagent, and tetrabutyl ammonium bromide solution, as activator. According to the derivatization condition, the derivative product was filtered through a 0.45 μm membrane, and then was directly analyzed by HPLC-UVD.

## Results and discussion

### Optimization of derivatization condition

Because the structure of GHB is very simple and the polarity is very high, it is difficult to analyze it directly in different samples with HPLC method. Since UVD detector is a typical common detector to be chosen in HPLC method, it must be derivated while analyzing GHB in different samples using HPLC-UVD method. In this article, the derivated procedure of GHB in urine was performed using 2-bromoacetophenone as derivative reagent and tetrabutyl ammonium bromide as activator under the suitable temperature, while adding NaOH and acetonitrile, the procedure is listed as follow:



In the procedure of derivation of GHB, many factors including the amount of derivative reagent and activator, the reaction temperature and the time of reaction were all tested in this article. In the end, the optimized results were obtained as the usage of derivative reagent was 3 times of GHB, the usage of activator was 1/3 time of derivative reagent, the reaction temperature was 60°C and the reaction was terminated after 30 min.

### Optimization of separation condition

According the corresponding reports in literatures, mobile phase of the analysis was optimized as methanol and water (48:52, v/v) and the detection wavelength was chosen as 245 nm by comparing the influence of wavelength to the detection of derivative product. The chromatograms of blank urine and GHB derivative product in urine under optimal separation condition are shown in Fig. 1. It can be seen that the retention time of GHB derivatization product was 6.30 min, and the separation was well with impurities while there was no interrupt of bland urine.

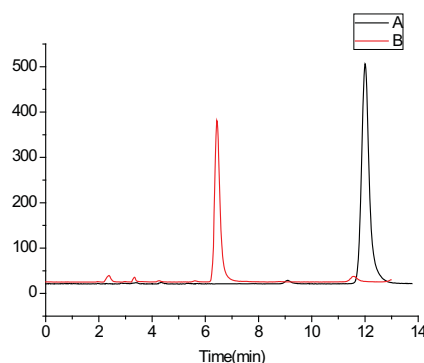


Fig. 1 Chromatograms of blank urine (A) and GHB derivative product in urine (B) under optimal separation condition

Moreover, calibration linearity of the method was investigated by analyzing different concentrations of human urine with the GHB standard. The calibration curve was obtained by plotting the peak-area of GHB derivative product against the concentrations of GHB in human urine. Good linearity was obtained in the range of 0.50  $\mu\text{g/mL}$ -250.0  $\mu\text{g/mL}$ , and the linear equation was  $Y=7465.6X+14354$  while corresponding coefficient was 0.995. In order to estimate the limit of detection (LOD) and the limit of quantitation (LOQ), spiked samples at different concentrations were analyzed. The LOD and LOQ of GHB developed in the present work are 0.25  $\mu\text{g/mL}$  and 0.50  $\mu\text{g/mL}$ , respectively, which were calculated on the basis of the chromatographic peak for which the signal-to-noise ratio was 3 ( $S/N=3$ ) for qualitative and 10 ( $S/N=10$ ) for quantitative. Moreover, recovery tests were also carried out by spiking with 2.0  $\mu\text{g/mL}$ , 25.0  $\mu\text{g/mL}$  and 200.0  $\mu\text{g/mL}$  GHB solutions and the average recovery is 87.24%.

### CONCLUSIONS

In this article, a pre-column derivatization and HPLC-UVD analytical method of GHB in human urine was developed and the results show high accuracy, good precision and sensitivity, and it can be widely applied in the identification of GHB in samples and in various caseworks.

### Acknowledgement

The financial supports of the Faculty Research Grant from Ministry of Public Security (No. 2010YYCXLNST012), the Natural Science Foundation of Liaoning Province of China (No. 201102246) and National Training Programs of Innovation for Undergraduates (No. 201210175051) in this study are acknowledged.

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3. Letteri J T, Fung H. Evaluation and development of gas chromatographic procedures for the determination of  $\gamma$ -hydroxybutyric acid and  $\gamma$ -butyrolactone in plasma. Biochem. Med., 1978, 20: 70-80.

4. Zhang S Y, Lin Y Z, Ke H W, Peng Y R, Huang Z R. Determination of  $\gamma$ -hydroxybutyric acid in urine by GC-MS. *Anal. Instrument*, 2005, 2: 24-27.
5. de Vriendt CA, van Sassenbroeck DK, Rosseel MT, van de Velde EJ, Verstraete AG, Vander Heyden Y, Belpaire FM. Development and validation of a high-performance liquid chromatographic method for the determination of gamma-hydroxybutyric acid in rat plasma. *J. Chromatogr. B Biomed. Sci. Appl.*, 2001, 752 (1): 85-90.
6. Chen X G, Ma S X, Ma X Z, Dang B, Liu C. Determination of gamma-hydroxybutyric acid in urine by liquid chromatography-mass spectrometry. *Guangdong Chem. Indu.*, 2013, 40: 17-18.
7. Johan Dahle'n, Thyrsa Vriesman. Simultaneous analysis of g-hydroxybutyric acid, g-butyrolactone, and 1, 4-butanediol by micellar electrokinetic chromatography. *Forensic Sci. Int.*, 2002, 125: 113-119.



## METHOD RESEARCH AND PRACTICAL APPLICATION OF VIDEO INVESTIGATION

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**Abstract:** With the implementation of strengthening police by technology, the forensic science technology has been placed in an important position. The video investigation is an important component of forensic science and it is indispensable technology for fighting against all types of crime with the construction of sky-net in China. In this paper, we first introduce the application status of video monitoring system at home and abroad. Then, the method and work flow of video investigation was studied based on the characteristics and function analysis of video investigation, which innovates and enriches the mean of investigation. Finally, the method was applied to the actual case and the results show that it can strengthen control ability of police, reactivity and ability of fighting against crime through using information and communications technology to video investigation, which can ultimately improve the efficiency and effectiveness of police work.

**Keywords:** sky-net project, video monitoring, video investigation, workflow, curb crime.

### INTRODUCTION

With the rapid development of video monitoring system in our country recent years, the video investigation has become an important tool to combat crime and it plays an increasingly important role in criminal detection and Law enforcement. Video monitoring system can directly display and objectively reflect the situation of crime scene, which has the function of real-time monitoring, providing clues, and locking target, fixing evidence and deterring crime. The new mode of investigation has been used in the practice of criminal investigation department. The method "from image to image" and "from image to people" has been developed. It can effectively expand the space-time of crime scene investigation, the investigation object, enrich the source of the case clues, improve the precision of the track block, enrich the composition structure of litigation evidence through comprehensive analysis of scene evidence information, personnel information, network information, communication information and vehicle information<sup>1</sup>. The video investigation has become the powerful weapon to precisely fight crimes for public security organ and it plays an irreplaceable and special role in criminal investigation.

At present, our country is in the period of contradictions among the people significant, criminal cases multiple and enemy struggle complicated. The responsibility of public security organ is heavy for fighting crime, protecting people and safeguarding social stability<sup>2</sup>.

All sectors of society enhance the supervision of public security law enforcement efforts and put forward higher and stricter requirements to the criminal investigation of public security organs, with the self-perfection of socialist democracy law construction at the same time. In this context, the task is heavier, more difficult and stressful for the public security authorities to crack down on criminal offense; it is difficult to adapt to the needs of modern criminal investigation work only depending on traditional criminal investigation methods. How to use the new technologies and tools, speed up the ability and the level of criminal investigation work is an important and urgent task for the forensic department of national public security. Among them, how to make full utilization of video tools to enhance the detection technology level is an indispensable important topic.

### VIDEO SURVEILLANCE SYSTEMS

Video surveillance system is safe guard system, which is an important part of a preventive ability of strong comprehensive system. Video monitoring is widely used in many occasions

<sup>1</sup> Lai J L, Yi Y. Key frame extraction based on visual attention model. J. Vis. Commun. Image R.

<sup>2</sup> Wang F S, Xu D, Wu W X. A cluster algorithm of automatic key frame extraction based on adaptive threshold. Journal of Computer Research and Development.

with its convenient, intuitive and abundant information content. With the development of modern science and technology in recent years, video surveillance technology also appeared a considerable development, video monitoring entered the digital network age. The development of video surveillance system is divided into three stages: digital monitor multimedia stage, digital monitor DVR stage and digital monitor network stage<sup>3</sup>.

## VIDEO MONITORING SYSTEM SIMULATIONS

The simulation of video monitoring system is divided into microprocessor-based video switch control plus PC multimedia management and pc-based recognizing the switch control of matrix host and system multimedia management of two types. Analog closed-circuit television monitoring system is actually the combination of many simulations monitoring equipment, System mainly consists of three parts “front-end device”, “terminal control device” and “signal transmission medium”, including: front-end equipment is mainly a camera, haecundae, decoder, control equipment is mainly a switching matrix, image segmentation device, monitor and control the keyboard, video, etc. Transmission medium includes cable, control and etc. With the enhancement of microprocessor and computer, there are lots of great changes in the functionality, the performance, reliability, structure pattern and so on of system. The composition of the video monitoring system is more convenient and the man-machine interface is friendlier. But because video monitor and control system does not change in the flow of information form, the video signal is still simulation system, and the network structure of system is mainly a single function, one-way, integrated way of information collection network. Although the system has developed to a high level, it has not much potential to dig and the limitation still exist. The digital system is the only way to meet the higher request<sup>4</sup>. The faults of simulation monitoring system are:

(1) Usually only suitable for the signal transmission of monitor video in small regional range, the transmission tool of analog video is mainly coaxial cable and transmission distance of video signal simulation is no more than 1 kilometers by coaxial cable. It determines that the analog monitor is only suitable for single building, small neighborhood and other small range of places because the transmission distance is shorter with twisted pair.

(2) The expansion ability of system is bad for already built system. If you want to add new monitoring point, you will find the new equipment hard to affix to the original system since it is often the butterfly effect.

(3) It is unable to establish effective alarm linkage because each part operates independently and the control protocols can link in the limited scope only.

## DIGITAL VIDEO SURVEILLANCE SYSTEMS

With the rapid development of digital multimedia technology, video compression technology and network communication technology, there are two types of digital video monitor system in the market today. One is the digital video equipment, another kind is Web server monitor system based on embedded core.

It creates conditions for Multimedia monitoring system based on PC with the development of digital video compression coding technology. This new video monitoring system rapidly rises and partially replaces the analog video monitoring mode whose core is image segmentation of video matrix, video recorder and other transmitter. Its advantage mainly displays in:

(1) The multimedia monitor host of PC can synthesize the function of video matrix, matrix image segmentation and video recorder, so the structure of the system is simplified.

(2) The remote network of digital multimedia cannot be limited by distance because of the utilization of computer network technology.

(3) It can save a lot of disk space and be advantageous to multimedia information query for the system due to the large capacity disk array inventory device or CD storage.

But as the development of the PC video surveillance video system in process of actual engineering, some shortages are also exposed and the stability of the system is poor. The

3 Koene A R, Li Z P. Feature-specific interactions in salience from combined feature contrasts: evidence for a bottom-up saliency map in V1. *Journal of Vision*.

4 Zhuang Y T, Rui Y, Huang T S. Video key frame extraction by unsupervised clustering and feedback adjustment. *Journal of Computer Science and Technology*.

structure of video surveillance video system based on PC is: compatible/industrial PC+video capture card+ordinary/more reliable operation platform+application software.

(1) PC performance is not very stable for 24 hour uninterrupted job, the stability of industrial control PC is relatively higher than compatible PC and suitable for complex working environment.

(2) Operating system: there are certain stability problems in Windows 98 for operation platform system. If the application software is not very standardized at the same time, the work is not stable, crashes, etc. in the process of utilization. The video surveillance system based on PC is relies on the operating system of Windows 95/98/NT, UNIX, and Linux and so on: system files, application software and image files are stored in the disk. The video processing must have high-density input of large quantities of data, ordinary logical disk(such as FAT32 in Windows) cannot adapt to develop and it is very easy to freeze.

(3) Application software: the simple software system cannot be used for security video monitoring system: application software of video monitoring system must support multitasking concurrent processing capability, such as monitoring, video, playback, backup, alarm, control, remote connection, etc.

(4) Video capture card: the video surveillance system is usually multiple input, the video capture card can use the way of multiple CARDS, also can use the single card mode. In simple terms, the single card is better than multiple cards in stability and integration. It is very easy to form hardware conflicts for one card to one way and affect the system stability. Embedded system is used as the center and software and hardware can be cut; it can adapt for the function, reliability and cost, volume of application system. It is tailor-made for monitoring system.

Embedded system mainly consists of embedded processor, relevant support hardware, embedded operating system and application software system etc. It is independent on the “device” based on hardware and software integration. Embedded operating system is software, which is a kind of real-time and supports embedded system. It is very important part of the embedded system and usually includes: hardware related software drivers, system kernel bottom, device driver interface, communication protocol, graphic interface, standardization browsers and so on. The advantages and disadvantages of embedded system:

(1) The system is special, so the system is small, instructions to streamline and processing speed is fast.

(2) System data in ROM/FLASH with fast speed cannot be altered and have a good stability.

(3) System has good real-time and stable performance.

(4) Document management system is more suitable for large amounts of video data.

(5) It is difficult to satisfy the network function, synchronization of video and audio.

## **THE DEVELOPMENT OF VIDEO MONITORING SYSTEM DEVELOPMENT DIRECTION OF VIDEO MONITORING SYSTEM**

Video digitizing, front integration, network, system integration is the development of video monitoring system and the digital is the premise of network. The network is the foundation of the system integration, so the biggest two characteristics are the digital and network<sup>5</sup>.

### **DIGITAL**

Digital is the 21<sup>st</sup> century feature and it is the development inevitable trend of electronic technology based on information technology. Digital is the pass towards growth with the development of the times; our living environment will become more and more digital.

It is the priority work to digital of video surveillance system form simulation status to digital status, which includes Video, audio, control and so on. It completely breaks the structure of “the center of classic closed-circuit television system: the camera imaging” and fundamentally changes mode and structural form of video monitoring system from information acquisition, data processing, transmission and system control. The flow of information digitization, coding compression, and opening video monitoring system can make agreements with the security system between each subsystem realize seamless connection. It comprehends the management and control in the unified operation platform.

<sup>5</sup> Shih H C. Key-frame extraction and key-frame rate determination using human attention modeling. Proceeding of ICME2011.

## **NETWORK**

The network of video monitoring system means that the structure of system will transit from lumped type to centralized-distributed. Distribution system adopts the structure of multilayer; it can achieve the task scheduling algorithm of fast response with micro kernel technology of real-time multitasking, multiuser, distributed operating system. The hardware and software of distributing type monitoring system is designed to be standardized, modular and systematic. The system configuration of equipment has the advantage, such as good generality, openness, flexible system configuration, perfect control function, convenient data processing, friendly man-machine interface, system installation, debugging, maintains simple and fault tolerance and reliable. From the above we can see that the development of videomonitor system has roughly experienced in analog video, network video and PC video three phases and depends on the technology of the network, communication and transmission platform.

### **THE WORKFLOW OF VIDEO INVESTIGATION THE CONCEPT OF VIDEO IMAGE INVESTIGATION**

Video image detection (it is abbreviated image investigation or visual detection) refers to the investigation method in the process of criminal investigation, which can obtain the video image in accordance with the law and comprehensively use investigation measures based on video monitoring and identification technology, electronic information display technology, computer technology and other information capture technology and database technology. It can obtain the investigative clues and evidence through correlation analysis, comparison and collision. It can catch the suspect and confirm the purpose of prevent, control, expose and confirm the crime. From definition of the video image investigation we can see that the main body of video image investigation is specially exercise state indictment of the investigation organ and investigator. The content of the video image investigation is the concrete application of image technology in the investigation activities. The purpose of video image investigation to collect evidence and determine the criminal suspect based on the analysis of image.

### **VIDEO CRIME SCENE INVESTIGATION**

Video surveillance system can record the dynamic process of event in the scope of monitoring as a product of modern science and technology development. It can provide effective information of criminal behavior and process, which is relevant in the case of the people, things and materials. It has become the new content of crime scene investigation for the criminal investigation department.

Video crime scene investigation can find and collect crime information by video monitoring, and expose the criminal behavior, which is based on the survey of video monitoring system, network and control range in the crime scene and related area. It includes three aspects:

(1) The work is to investigate the video monitoring (probe) of the crime scene and related area, understand the monitoring area and the surrounding site environment and grasp the situation of direction, angle, the scope of monitoring and blind area (monitor hole);

(2) The work is to master its working procedure and principle, evaluate its use value and prepare to search, view and collect related information based on the understanding of control system and program;

(3) The related information of crime can be retrieved, viewed and gathered.

### **PROCEDURES AND METHOD OF VIDEO CRIME SCENE INVESTIGATION**

Video crime scene investigation can determine the time, region, direction and route according to survey and inspection information of technicians, which is established on crime scene investigation.

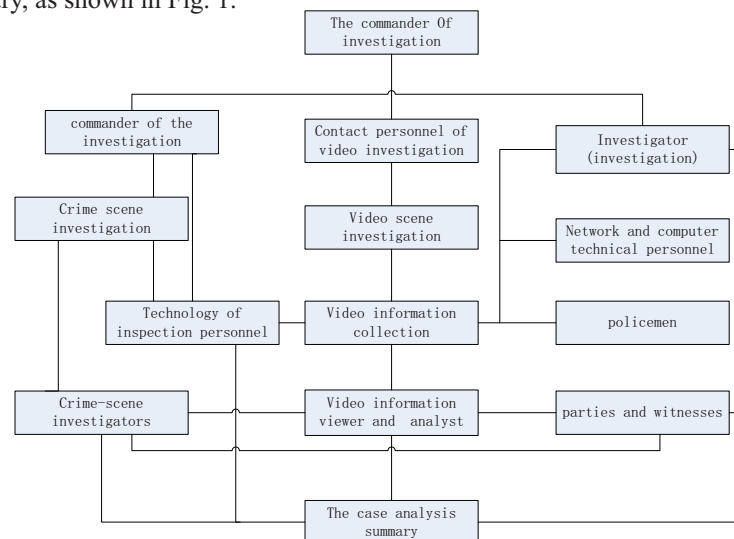
## ORGANIZATION AND COMMAND OF VIDEO CRIME SCENE INVESTIGATION

It must establish the unified command system in order to improve the efficiency of video investigation. This system is not only the part of crime investigation system, but also the part of investigation system, so it is relatively independent.

It is commanded by the head of forensic department or assigned person. The video surveillance group will be established for grave and complicated case or the case of intensive distribution and assigned person is responsible for the direct and coordinate investigation work.

The video surveillance group members of complicated case include commander, liaison, video site exploration engineer, time correction person, collectors, video information viewer, etc.

Personnel includes detector, policemen, criminal technicians (professional image analyst), the network personnel of computer technical, the internal security guards of using video monitoring in enterprises, etc. The relevant parties and witnesses can participate and identify if it is necessary, as shown in Fig. 1.



*Fig.1 the structure of video surveillance group*

## THE PREPARATION FOR VIDEO SCENE INVESTIGATION

The video scene investigation must be combined with the crime scene investigation and it cannot be isolated. The video investigators must attend the crime scene investigation before they survey the around road of crime scene, traffic, location, direction and scope of monitoring point, etc.

(1) Master the material evidence of suspect at the crime scene: such as the footprints types of criminal suspects, what kind of shoes, sports shoes, leather shoes, cloth shoes, sandals or bare feet, etc. We can determine the number of criminal suspects and analyze the criminal suspect's age, height, body, and so on through consulting footprint expert. It can facilitate finding and identifying possible suspects from surveillance video.

(2) Master the crime tools of crime suspect in the crime scene: it can determine the number of crime tools, size and length by trace experts. These tools are brought by the criminal suspect or used local materials. Where is the initial position of crime tools if it is from the local and whether left at the scene?

(3) Master the change of objects in crime scene: what objects at the crime scene the suspect steals or leaves, the quantity, size, shape and weight of objects is very important to criminal detection.



(4) Master the evidence distribution of crime scene: we can calculate the time of crime process and judge the route of import and export through the evidence distribution of crime scene. We also can infer the time of death and crime according to the forensic determination of body temperature, which helps us to diagnose the elapsed time of crime. To determine the time of crime is the important basis in order to lock and identify suspect in the around monitoring.

### **THE STEPS AND METHODS OF THE VIDEO SCENE INVESTIGATION**

The work of video scene investigation is based on crime investigation and survey according to certain steps and methods. It includes the field reconnaissance of related video monitoring, the access of installer and user to video monitoring system, the layout of the video monitor and determine the effective monitoring point by preliminary view.

Planning the area and the route, surveying the monitoring points

We can plan the route, the direction and the scope of video crime scene investigation in combination with the case and the construction of video monitoring. The investigation personnel can master the installation position, the direction and the angle of the front monitor. Then we can know the geographical location, road environment and light conditions of the around monitoring, understand the visual range and the blind area of monitoring. Finally we can analyze the target direction (determine monitoring channel), location (make sure the picture space ratio), time (appear period in the picture), the closed situation of monitoring point and the remedial measures.

(2) Drawing the distribution of video scene

It is needed to draw the distribution of video scene and mark the position and direction of monitoring within the investigation scope for complex cases and dense distribution of video monitoring. It can easily coordinate various launching work and reduce the loophole of detective work for the series of cases in same area.

### **THE MAIN METHODS OF VIDEO IMAGE INVESTIGATION**

The video image investigation is complicated, having the inherent characteristics of video image data and the special needs of investigation. We need to collect the video image data in the center scene, discover the peripheral video image data, analyze visible dominant information and mine hidden information from video image information, communication and information, bank card information, Internet information, accommodation information, GPS information and so on.

### **THE TREND METHOD**

The trend method means that we can find the clues according to the trend of the development events. Events are generally along the time tracks, space trajectory and logic trajectory, so the video image investigation is usually based on it. There are three ways: one is based on the timeline, the second is based on spatial point, and third is based on logical order. The trend method based on timeline emphatically probes time points after the change in the video image and find the case clues and features, which is mainly based on the time of the case as the reference point. The suspect will escape from the crime scene, destroy criminal evidence and hide their identity after committing crime. These activities are inevitably accompanied by changes in space. The trend method based on spatial point is to analyze the space of criminal suspect according to the existing image data, repeat process, and collect criminal evidence and to find its foothold. It is difficult to monitor the entire process of criminal suspect, so we should carry on the track with characteristic obvious markers as important reference and quickly lock the suspect, such as people's physical features, clothing, transport, and carry-on baggage and so on.

### **THE REVERSE METHOD**

The reverse method is to find how the things were developing to the present stage. There are three basic methods: the timeline, the spatial point, and the logical order. We often check the video monitor from the victim since only the victim is innocent in general. We can usually find out his behavior, emotions and contact or interaction with others, then identify the cause of crime and the process and

further determine the criminal suspect. In addition we still can check the scene before the crime to find the information of suspect entering the scene. We can find the image information of the victim and criminal suspect from surveillance video around the scene. We can draw the path diagram of the criminal suspect or the victim after the crime and finally dig out the clues to solve crimes. There are two aspects for logical order: one is the legacy of the physical evidence as the breakthrough point, second is special behavior of people in video information as the breakthrough point.

### THE INFORMATION CORRELATION METHOD

We will not only analyze apparent information of video image data, but also discover and verify the hidden information of video image in video image analysis process. Because the information of time and space in the video image is very accurate, it can provide the conditions to find the other trace evidence and related information in the key point. The combination method of video images and call information: we should obtain all communication data in the location of withdrawals, internet, shopping, accommodation and committing crime. Then we can determine the activity trajectory of the criminal suspect, associate members and social relationships. Finally we can find out the criminal suspects' mobile phones and catch the suspect with technical investigation. The combination method of bank card information has become the most convenient, economic and practical way. We can get the video images and related information of criminal suspect from the monitoring system of bank branches inside and outside, especially on ATM. The bank card contains identity, capital turnover, rich information and online banking system is very convenient to query related transactions, so it is very effective and simple method to investigate. In addition there are other information correlation methods, such as: internet information, hotel accommodation registration information, trace evidence, vehicle GPS information, out of the city traffic information, flight information and traffic illegal information.

### PRACTICAL APPLICATION OF VIDEO INVESTIGATION

The 110 command center of Jiangdu public security bureau received alarm from Hong Kong businessman Mr. Chen on March 19, 2010. His Audi car's glass was smashed and rolling suitcase was stolen, which was parked in front of the Jiangdu international hotel during the night. There were China Yuan, Hong Kong dollars, euros, notebook computers, high-grade watches and other items in the bag and total value was more than seventy thousand Yuans.

We found a purse in isolation belt near the scene, then we found the owner of the package according to the payment documents. The owner reflected that she didn't know at what time she lost package and just remembered that she drove to inn "between nine and a half" on the evening.

The criminals first stolen the Guangzhou Honda at the door of the inn, then escaped to Jiangdu international hotel and stolen Audi car according to incorporate situation analysis. We could find the car using the reverse method of video investigation, as shown in Fig.2-Fig.3.



Fig.2 The door of the inn Fig.3 The gate of the hotel

We could get the suspected license plate“?Hqw888” through video processing, the owner of plate was Liu Qinghao (male, 52, living in Anqing city, Anhui province) by online query. But the owner reflected that his car was stolen on February 7, 2010. We found that the stolen car drove on highway from Huainan at 4.31 p.m. and exported from brick Tower Bridge at 6.10 p.m.. According to the orbit of suspected vehicles, we then found the mobile telephone number (1393\*\*\*2570), which was the GPS bundle number of Car Rental Company in Shijiazhuang. Finally, we locked the crime vehicles, the criminal suspect’s identity, phone number and captured the criminal suspect.

### CONCLUSION

In this paper we first introduce the application status of video monitoring system at home and abroad. Then, the method and work flow of video investigation is studied based on the characteristics and function analysis of video investigation, which innovates and enriches the mean of investigation. Finally, the method is applied to the actual case. In short, video image investigation has been more and more widely attention as a new kind of detection methods. In order to continue to push forward the deep application of the video image investigation, we must stick to the dominated by investigation, correctly handle the relationship with the traditional detection methods and apply it normalized.

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## NON-HUMAN FORENSIC DNA DATABASES: CANINE DNA AS A SIGNIFICANT FORENSIC IDENTIFICATION TOOL

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**Abstract:** Canine DNA profiling, followed by the establishment of canine DNA databases, has gained increasing attention in forensic science research and practice in the past decade. Given the fact that dogs are among the most widespread pets around the globe, this owner-pet association allows for establishing the connection between the perpetrator of a crime and the crime scene and/or victim, as well as the victim and the crime scene, through dog DNA analysis. In addition, canine forensic DNA analysis is proving to be of great value in dog attack cases, such as dog bites by stray dogs, an issue which occurs worldwide. Further, canine DNA databases are being established in order to prevent illegal dog fighting and other forms of animal abuse and cruelty. In this paper, the author addresses technical aspects of canine DNA analysis, with a particular emphasis on its application in contemporary forensic practice. Specific relevance of the topic for the Republic of Serbia is also thoroughly discussed.

**Keywords:** forensic canine DNA profiling, databases, STR typing

### INTRODUCTION

Human DNA analysis is a widespread and significant procedure in routine forensic work. DNA profiling for human identification occurs daily worldwide. Thus, DNA has become an invaluable forensic tool, a golden standard, for solving various types of crimes. DNA fingerprinting, based on Restriction Fragment Length Polymorphisms (RFLP), was used in court for the first time in 1988, when Colin Pitchfork was convicted for murders and rapes in Great Britain. Since then, forensic DNA analysis has been based on Polymerase Chain Reaction (PCR), which allows obtaining an individual DNA profile from significantly less biological material, and even from partially degraded samples.

Several DNA profiling methods currently exist, the most common being Short Tandem Repeat (STR) or Microsatellite typing. STRs are repetitive DNA fragments which exist throughout the genome. They consist of 2-6 nucleotide long fragments (bi- to hexa-nucleotides), which are repeated from three to 100 times. Typical human STR loci used in forensics are tetra- and penta-nucleotides<sup>1</sup> and the number of times they are repeated varies between individuals, making them an ideal tool for differentiating between individuals, thus accurate identification<sup>2</sup>. Since a particular DNA profile on any given locus can be shared by many people, it is necessary to analyze multiple STR markers in order to achieve appropriate discrimination power and accurately identify an individual. For example, 13 STR loci are routinely typed in the US, 15 in Serbia, etc. Each DNA profile occurs with a particular frequency in the population<sup>3</sup>, which defines Random Match Probability (RMP) - the probability that two random, unrelated DNA profiles are identical. Claims of individualization in court, based on such statistical parameters, rather than subjective expert opinion, is the very key to high credibility of DNA analysis for human identification in forensics.

It has been estimated that approximately 70 million dogs live in the United States<sup>4</sup>, 4.8 million in

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Germany<sup>5</sup>, 4.7 million in Australia<sup>6</sup>, 2 million in Czech Republic<sup>7</sup> and over half a million in Austria<sup>8</sup>. Given their numbers globally, as well as the proximity in which they live with humans, dogs have been recognized as significant players in some forensically relevant cases. For instance, when dogs share a home with their owners, transfer of hair between a pet and humans is inevitable. In 1994, for the first time DNA profile obtained from cat's hair served as evidence in court during a murder case (see below)<sup>9</sup>. Also, dogs defecate in public spaces, thus leaving their biological material (shed stomach and intestine cells), which can present compelling evidence in criminal investigations. In 2000, dog fouling which ended up on suspect's shoes linked him, through dog DNA analysis, to a murder crime scene in Indiana<sup>10</sup>. In the examples above animals were essentially "witnesses" to criminal cases, as their biological material was transferred to the crime scene and/or humans present at the crime scene. On the other hand, dogs can be perpetrators of a crime, when attacking a person or another animal, causing accidents or property damage<sup>11</sup>. Finally, dogs can be victims of a crime, as in animal cruelty or animal theft cases<sup>12</sup>.

Despite the obvious benefits of canine DNA profiling in forensics and the increasing interest in the field in the past two decades, up to date a small number of laboratories perform such analyses and international standards are still lacking. In this paper, research efforts in the past decade aiming to lay down scientific basis for the routine use of canine DNA analysis in forensics and the justice system are described. Further, specific scenarios where canine DNA profiling can be vital are discussed at length, particularly how they pertain to the circumstances in the Republic of Serbia.

## TECHNICAL ASPECTS OF CANINE DNA ANALYSIS IN FORENSICS

The ultimate goal of applying scientific techniques and procedures in forensic investigations is to create evidence/proof which is accepted by the court. In order to be accessible in court as evidence for identification, STR loci used in forensic DNA profiling must be demonstrated as highly polymorphic (i.e. present in different forms/alleles in the population), sufficiently studied in scientific experiments and generally accepted by the scientific community<sup>13</sup>. In addition, statistical estimates defining their frequency/uniqueness in the population should also exist<sup>14</sup>. However, the development of canine-specific STR marker assemblage, which includes loci easily amplified in a multiple PCR reaction, producing consistent electrophoretic peaks and exhibiting heterozygosity above 70%, poses, in fact, the greatest challenge<sup>15</sup>. The minimal number of STR loci to be used should be determined, so that the resulting RPM estimates depict individualization<sup>16</sup>.

In 2004, Eichmann and colleagues evaluated 15 STR tetramers (ZUBECA6, FH2132, FH2087Ua, ZUBECA4, WILMS-TF, PEZ15, PEZ6, FH2611, FH2087Ub, FH2054, PEZ12,

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11 <http://www.vgl.ucdavis.edu/forensics/index.php>

12 <http://www.vgl.ucdavis.edu/forensics/index.php>

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16 Scharnhorst, G., & Kanthaswamy, S. (2011). An assessment of scientific and technical aspects of closed investigations of canine forensics DNA—case series from the University of California, Davis, USA. *Croatian medical journal*, 52(3), 280-292.

PEZ2, FH2010, FH2079, VWF.X) on 131 randomly selected dogs in three multiplex PCR reactions<sup>17,18</sup>. In addition, as in human DNA profiling, two sex-related markers (SRY and CHR.X for males and CHR.X for females) were also included in the analysis. Based on a set of chosen STR markers, probability of identity was calculated to be  $8.5 \times 10^{-8}$   **$8.5 \times 10^{-8}$** , indicating that the chosen STR panel would be sufficient to prove identity and would be appropriate for dog individualization use. Given that all canine DNA profiling had been done with “in house” set of STR markers used by individual laboratories, these studies were the first attempts to generate a common, globally accepted panel of STR loci for forensic canine DNA work. Such standardization is clearly an imperative, in order for laboratories to exchange and compare data. These studies also laid groundwork for the future formation of canine DNA databases.

In another study additional 6 polymorphic loci, including PEZ3, PEZ6, PEZ8, PEZ10, FHC2161, and FHC2328, were evaluated for their ability to be used in canine forensic DNA analysis<sup>19</sup>. Thus, a total of 21 canine-specific STR loci were thoroughly described, together with their population allele frequencies<sup>20</sup>. This work extended efforts to select the most informative set of loci that would be used in routine forensic practice worldwide.

Despite the initial studies and significant contributions canine DNA testing would have in forensic investigations, it remained underutilized. This is due to the lack of commercially available multiplex PCR kits and standardized procedures<sup>21</sup>. Joint efforts of public and private laboratories yielded a so-called Finnzymes reagent kit, which enables amplification of 18 STR markers and sex-linked loci in a single multiplex PCR reaction<sup>22</sup>. Reproducible, informative and robust results were achieved, so that the kit can be developed for commercial exploitation.

In 2011, still only specialized laboratories performed canine DNA testing and the resulting analyses were mainly admissible in court cases in which all other resources have been exploited<sup>23</sup>. In order to achieve acceptance of canine DNA profiling as evidence by courts more readily, as accurate, reliable and informative forensic tool, several guidelines and recommendations have been developed:<sup>24</sup>

- Use of electronic case management system to document chain of custody and assure proper sample handling

- Processing of sealed samples only

- Use of internal electronic tracking system for proper evidence documentation

- Processing of reference and unknown samples separately

- Species-specific internal allelic ladder to be developed by the laboratory and included in the analysis

- Utilization of standardized and reviewed STR markers

- Inclusion of pure bred, mixed bred and geographically diverse dogs in analyses

- Inclusion of RMP calculations

- Reporting in language easily understandable by broad public

As most available data comes from the US, the efforts have also been made to genotype European dogs, as in a 2012 UK study which profiled 375 dogs on 15 STR loci and a sex-linked

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marker<sup>25</sup>. Estimated RMP was  $2.85 \times 10^{-17}$  for unrelated individual dogs, across breeds examined<sup>26</sup>.

Quality assurance and quality control in all aspects of forensic canine identification (from sample collection to reporting in court) remain the weakest points to date. In previous published work, either some of the STR markers evaluated did not satisfy the necessary criteria (guidelines set by the Scientific Working Group for DNA Analysis Methods (SWGDM)) or they were processed in several multiplex reactions. Thus, while individual canine DNA profiling had been performed, globally accepted STR panel that would be used in laboratories worldwide did not. Through genome data mining, Wictum and colleagues selected a panel of 15 new STR and one sex-linked marker, known as DogFiler<sup>27</sup>. The assemblage of loci was amplified in a single multiplex PCR reaction and successful DNA profiles were obtained from as little 60 pg of genomic DNA<sup>28</sup>. Additionally, as commercially available ones do not exist, allelic ladder was generated enabling sharing of canine DNA profiles and canine DNA databases. Following the SWGDAM recommendations, DogFiler demonstrated to be an accurate and robust kit with high discrimination power and reproducible results which can be used even on degraded sample; thus, it is the first well-rounded animal forensic model<sup>29</sup>. As such, it has been accepted as criminal casework evidence in court and served as a basis for the formation of dog fighting database (see below)<sup>30</sup>.

Similarly to humans, mitochondrial DNA (mtDNA) analysis has been performed for dogs as well<sup>31,32,33,34</sup>, such as mitochondrial cytochrome b gene sequencing for dog species identification<sup>35</sup>. mtDNA analysis are of great significance in forensics where samples are often scarce in DNA and/or degraded. This is due to high number of copies of mtDNA per cell and the circular mitochondrial genome resistant to exonucleases<sup>36</sup>. From 2006 to 2008, Non-Human Forensic Genetics Commission of the Spanish and Portuguese Working Group (GEP) of the International Society for Forensic Genetics (ISFG) laboratories participated in the general quality control and quality assurance evaluation, as well as assessment of new technologies and types of markers<sup>37</sup>.

In efforts to attempt to identify individual dogs and breed type, canine mtDNA control region was examined and polymorphisms characterized in its hypervariable segments I (HSV-I) and II (HSV-II), as well as in a repeat region between them<sup>38</sup>. A “hotspot” within the HSV-I has been recognized as particularly informative molecular tool, especially with low copy DNA or degraded samples<sup>39</sup>. However, a study in which mtDNA control region of almost 600 dogs was

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39 Himmelberger, A. L., Spear, T. F., Satkoski, J. A., George, D. A., Garnica, W. T., Malladi, V. S., ... &Kanthaswamy,



sequenced, demonstrated that majority of dogs fall within large haplogroups<sup>40</sup>. In other words, analysis of mitochondrial control region only cannot distinguish between pure bred, mixed bred and dogs originating from distinct geographical backgrounds. Instead, additional sequencing of the mtDNA genome is necessary in order to identify informative single nucleotide polymorphisms (SNPs), which place individual dogs into smaller sub-haplotypes<sup>41</sup>.

### DOGS AS SILENT WITNESSES TO CRIMES

Given that dogs are tightly incorporated into human life and represent a favorite pet worldwide, it is not surprising that their biological material is deposited on objects and/or humans found at crime scenes. Being able to take advantage of such circumstances and use them in order to solve crimes is an exciting possibility. The first ever case to use non-human DNA in court occurred in 1994 in Great Britain, when feline hair linked its owner, the main suspect in the case, with the crime scene<sup>42</sup>. DNA profile obtained, based on 10 dinucleotide STRs from cat hair, found on the leather jacket at the crime scene, was later used to convince the suspect of a murder<sup>43</sup>. In a 2001 London case, nightclub bouncer was stabbed to death during a fight in which a bull terrier was also hurt<sup>44</sup>. DNA profile obtained from dog blood trail leading to the suspect friend's house was determined to be 1 in a million and matched a reference DNA profile of his bull terrier Colonel<sup>45</sup>. Thus, the perpetrator of a crime was identified and sentenced, in large part due to an accurate identification of a dog involved. In the early 2000s, canine DNA profile comparisons showed that dog excrement found on the shoe of Phillip Stroud, a suspect in a triple murder of construction workers in Indiana who witnessed a burglary Stroud allegedly participated in, matches the one found on the crime scene<sup>46</sup>. This served as a main piece of evidence in sentencing Stroud to life in prison. Similarly, a man was found guilty of rape in 2008 in Texas, when dog excrement found on his shirt was shown to match the one of victim's dog, through DNA analysis<sup>47</sup>. In a 2010 trial, *People vs. Ige*, DNA profiles from hairs collected from the floor mat at the crime scene matched the ones obtained from hairs of three dogs that shared a house with Ige<sup>48</sup>. mtDNA analysis of canine hair was also used to demonstrate that DNA profile matched the one of the victim's dog, a seven year old girl in California<sup>49</sup>.

As illustrated by previous examples, canine DNA profiles utilized in court as evidence identifying individual dogs and linking suspects to crimes, came from various biological sources, including hair, feces, etc. It is important to note that not all biological material is an equally valuable source for DNA analysis. For example, it has been shown in experiments that during canine mtDNA analysis hair samples present more difficulties than bloodstains for achieving a successful DNA profile<sup>50</sup>. Additionally, it is well known from human DNA profiling, that fecal samples contain PCR inhibitory compounds, such as bilirubin. Substantial work has been done to generate procedures and kits which overcome this issue.

The first accredited forensic laboratory for animal DNA analyses became The Veterinary Genetics Laboratory at the University of California's School of Veterinary Medicine in Davis in 1999. The increasing need for such analyses by law enforcement resulted in approximately

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44 <http://community.seattletimes.nwsourc.com/archive/?date=20011121&slug=dogdna21>

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46 Mott, M. (2006, December 12). Animal DNA becoming crucial CSI clue. *National Geographic News*. Retrieved December 29, 2013, from <http://news.nationalgeographic.com/news/2006/12/061212-animals-CSI.html>

47 <http://www.chron.com/news/houston-texas/article/Dog-feces-DNA-leads-to-man-s-conviction-in-rape-1622178.php>

48 <http://legal.pblnn.com/pit-bulletin-legal-news-radio/97-disclaimer>

49 Jobling, M. A., & Gill, P. (2004). Encoded evidence: DNA in forensic analysis. *Nature Reviews Genetics*, 5(10), 739-751.

50 Eichmann, C., & Parson, W. (2007). Molecular characterization of the canine mitochondrial DNA control region for forensic applications. *International journal of legal medicine*, 121(5), 411-416.

100 criminal cases a year being processed, in addition to civil cases which often include dog custody disputes<sup>51</sup>.

### DOGS AS PERPETRATORS OF CRIMES

According to the estimates given by The World Health Organization (WHO), approximately 200,000,000 stray dogs exist around the World<sup>52</sup>. Although stray dog problem is the most common in Asia and Africa<sup>53</sup>, it is also of significant concern in some European countries, such as Romania and Serbia. Namely, unofficial estimates show that approximately 100,000 stray dogs live on the Serbian territory<sup>54</sup>. According to one source, up to 6,640 cases of stray dog attacks annually, or 18 daily, are reported in Serbia<sup>55</sup>. Obviously, such attacks are accompanied by serious consequences. WHO estimates that 55,000 people die from rabies annually, while 15,000,000 are treated in order to prevent the development of the disease<sup>56</sup>. As for Serbia, 2,704 patients were treated at the Clinic for Infectious and Tropical Diseases, Clinical Center of Serbia for consequences of stray animal bites in 2012<sup>57</sup>.

In addition to the horrifying physical, psychological and emotional consequences that dog attacks can cause to individuals, both young children and adults, they also have an economic impact on the government. According to the *Serbian Supreme Court of Cassation's* jurisprudence, government compensation for dog attacks ranges between 175 and almost 9,000 euros<sup>58</sup>, depending on the severity of injuries and experienced trauma. City of Belgrade alone spent around 116,000 euro in 2010 and more than 80,000 euro in 2011 on court settlements and court compensations which are a consequence of stray dog attacks<sup>59</sup>.

Even in countries where stray dog problem is not pronounced, dog bite statistics are not encouraging, due to injuries by pet dogs. Approximately 3.5 to 4.7 million dog bites occur annually in the US<sup>60</sup>, 100,000 in Australia<sup>61</sup> and 30,000 in Germany<sup>62</sup>. For example, a 16 year old boy was murdered in London in 2009, by two pit bull terriers. The evidence came from canine DNA profiling which suggested that it was billion times more likely that tested samples in the investigation came from these two specific dogs, rather than any other ones. Clearly, having a tool for accurate identification of a dog that attacked a human or another animal is of great importance.

During forensic investigations of dog bite cases, various tissues can serve as evidence, including dog saliva from bite marks, dog blood, urine, feces and hair<sup>63</sup>. One study performed in 2004 investigated 52 dog attacks by analyzing 15 canine-specific STR markers<sup>64</sup>. Individual dog DNA profiles were obtained from saliva samples collected from both the bite site, as well as the bandage previously placed on the wound in order to stop the bleeding<sup>65</sup>. Interestingly, successful canine STR typing was not inhibited by the presence of human blood and it was, on the contrary, superior in more severe (in other words, bloodier) dog bites<sup>66</sup>. However, it may

51 Rhee, F. (2013, September 1). UC Davis lab takes CSI to the next level by helping police catch killers through pet DNA. *The Sacramento Bee*. Retrieved December 29, 2013, from <http://www.sacbee.com/2013/09/01/5693606/uc-davis-lab-takes-csi-to-the.html>

52 Strand, P. (2011, September, 11). *The Global Stray Dog Population Crisis*. National Animal Interest Alliance.

53 Strand, P. (2011, September, 11). *The Global Stray Dog Population Crisis*. National Animal Interest Alliance.

54 <http://www.casopisgrad.com/t/ulicama-srbije-luta-100000-pasa-i-bice-ih-jos-vice>

55 [http://www.alo.rs/stari-alo/Za\\_ujed\\_lutalice\\_tuzite\\_opstintu/957](http://www.alo.rs/stari-alo/Za_ujed_lutalice_tuzite_opstintu/957)

56 Strand, P. (2011, September, 11). *The Global Stray Dog Population Crisis*. National Animal Interest Alliance.

57 [http://www.danas.rs/danasrs/srbija/beograd/za\\_lekara\\_2000\\_ujeda\\_godisnje.39.html?news\\_id=264149](http://www.danas.rs/danasrs/srbija/beograd/za_lekara_2000_ujeda_godisnje.39.html?news_id=264149)

58 [http://www.b92.net/info/vesti/index.php?yyyy=2013&mm=03&dd=14&nav\\_category=206&nav\\_id=695446](http://www.b92.net/info/vesti/index.php?yyyy=2013&mm=03&dd=14&nav_category=206&nav_id=695446)

59 <http://www.mojedete.rs/7055-Grad-isplatio-oko-80000-evra-kao-naknadu-stete-za-ujede-lutalice-.html>

60 Overall, K. L., & Love, M. (2001). Dog bites to humans-demography, epidemiology, injury, and risk. *Journal of the American Veterinary Medical Association*, 218(12), 1923-1934.

61 Clarke, M., & Vandenberg, N. (2010). Dog attack: the application of canine DNA profiling in forensic casework. *Forensic science, medicine, and pathology*, 6(3), 151-157.

62 De Munnynck, K., & Van de Voorde, W. (2002). Forensic approach of fatal dog attacks: a case report and literature review. *International journal of legal medicine*, 116(5), 295-300.

63 Clarke, M., & Vandenberg, N. (2010). Dog attack: the application of canine DNA profiling in forensic casework. *Forensic science, medicine, and pathology*, 6(3), 151-157.

64 Eichmann, C., Berger, B., Reinhold, M., Lutz, M., & Parson, W. (2004). Canine-specific STR typing of saliva traces on dog bite wounds. *International journal of legal medicine*, 118(6), 337-342.

65 Eichmann, C., Berger, B., Reinhold, M., Lutz, M., & Parson, W. (2004). Canine-specific STR typing of saliva traces on dog bite wounds. *International journal of legal medicine*, 118(6), 337-342.

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be quite challenging to successfully examine and discover dog saliva on clothes and bandages heavily stained with human blood<sup>67</sup>. In another study, in addition to the swabbing method for the collection of canine saliva, successful DNA profiles also resulted from tape lifts of dried saliva stains<sup>68</sup>. The later analysis was performed on 11 in-house STR loci. While these investigations made significant progress in identifying dogs responsible for attacks in individual cases, standardizing the process and the use of common set of STR markers across different laboratories is crucial.

Animal Network, the only accredited forensic canine laboratory in Australia, formed a “dangerous dog database”<sup>69</sup>. This DNA register contains DNA profiles from dogs involved in aggressive instances, which are indefinitely stored. DNA profiles from samples taken during dog attack scenes are then compared to the ones in the database. The evidence is valuable in both criminal and civil court cases<sup>70</sup>.

### DOGS AS VICTIMS OF CRIMES

Several dog breeds collectively called pit bulls, and further, specific bloodlines have been selectively bred for aggressiveness and fighting for many generations worldwide. For example, while an “average” pit bull can be bought for just 50 euro on the Serbian black market, an offspring of two well-known pit bull “fighters” costs up to several thousand euros<sup>71</sup>. In addition to having their genetic profile selected, these animals are also trained for dog fighting, spending their lives heavily chained, abused, beaten, starved, drugged with steroids, etc., with a goal of enhancing their endurance and gameness<sup>72,73</sup>. Dog breeding, training, fighting and gambling represents a multimillion dollar industry in the US<sup>74</sup>. In Serbia, several organized dog fighting events have been uncovered nationwide in the past few years, such as the ones in the outskirts of Belgrade, Šabac, Jagodina, Loznica, Kruševac and Sremska Mitrovica<sup>75</sup>. In these matches, bets ranged from a couple hundred euros to 100,000 euros for VIP fights<sup>76,77</sup>. In addition to fines, the penalties for participating in dog fighting industry in Serbia range from three months to three years in prison<sup>78</sup>.

Modeled on the FBI’s human Combined DNA Index System (CODIS), a criminal dog fighting DNA register was established in 2010 in the US, in order to fight against dog fighting both nationally and internationally. This DNA database contains: 1) DNA profiles of dogs captured during dog fighting investigations and 2) unknown DNA profiles from samples (such as blood, saliva, urine, feces and bones) collected at suspected dog fighting venues<sup>79, 80, 81, 82</sup>. Searches and matches through canine CODIS DNA profiles enable connecting aggressive dogs, their breeders and trainers, as well as operators of dog fighting events. In other words, such DNA analysis will allow determining whether dogs of individuals suspected to be involved in dog fighting activities belong to known bloodlines; it will also enable determining whether an individual dog was

on dog bite wounds. *International journal of legal medicine*, 118(6), 337-342.

67 Clarke, M., & Vandenberg, N. (2010). Dog attack: the application of canine DNA profiling in forensic casework. *Forensic science, medicine, and pathology*, 6(3), 151-157.

68 Clarke, M., & Vandenberg, N. (2010). Dog attack: the application of canine DNA profiling in forensic casework. *Forensic science, medicine, and pathology*, 6(3), 151-157.

69 <http://www.animalforensics.com.au/dogattack.php>

70 <http://www.animalforensics.com.au/dogattack.php>

71 <http://www.blic.rs/Vesti/Hronika/271429/Na-ilegalnim-borbama-pasa-zarada-kladionicara--veca-od-100000-evra>

72 <http://www.blic.rs/Vesti/Hronika/271429/Na-ilegalnim-borbama-pasa-zarada-kladionicara--veca-od-100000-evra>

73 <http://people.howstuffworks.com/dogfighting.htm>

74 <http://www.prnewswire.com/news-releases/dog-fighting-dna-database-breaks-new-ground-in-crackdown-on-animal-cruelty-96390719.html>

75 <http://www.blic.rs/Vesti/Hronika/271429/Na-ilegalnim-borbama-pasa-zarada-kladionicara--veca-od-100000-evra>

76 <http://www.nadlanu.com/pocetna/info/drustvo/Surove-borbe-pasa-Dobitak-i-do-100000-evra.a-165300.295.html>

77 <http://www.blic.rs/Vesti/Hronika/271429/Na-ilegalnim-borbama-pasa-zarada-kladionicara--veca-od-100000-evra>

78 <http://www.nadlanu.com/pocetna/info/drustvo/Surove-borbe-pasa-Dobitak-i-do-100000-evra.a-165300.295.html>

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80 <http://www.prnewswire.com/news-releases/dog-fighting-dna-database-breaks-new-ground-in-crackdown-on-animal-cruelty-96390719.html>

81 Gay, M. (2010, June 26). Effort Uses Dogs’ DNA to Track Their Abusers. *The New York Times*. Retrieved December 29, 2013, from [http://www.nytimes.com/2010/06/27/science/27dna.html?\\_r=0](http://www.nytimes.com/2010/06/27/science/27dna.html?_r=0)

82 <http://www.vgl.ucdavis.edu/forensics/CANINECODIS.php>

present at a dog fighting venue. This database currently contains about 1,000 DNA profiles<sup>83</sup>. Clearly, identification and prosecution of individuals involved in this federal crime in most countries is essential for the prevention of dog abuse and cruelty.

In addition, canine DNA profiling is also performed in identifying the remains of lost dogs, as well as in cases of dog thefts.

### OTHER USES OF CANINE DNA

Over 25,000 tons of dog fouling are deposited on public property (parks, sidewalks, beaches, etc.) daily in the US<sup>84</sup>, over a 1,000 tons in Germany<sup>85</sup> and approximately a ton in Czech Republic<sup>86</sup>. In the past decade, identifying individuals who do not clean their dog's fouling has gained increasing popularity around the globe. The reason for this is to successfully manage waste problems and live in cleaner and more eco-friendly environment. Additional reason is prevention of water contamination, as dog fouling that accidentally gets washed off into pools of water can impact fish, algae and other aquatic life<sup>87</sup>. Finally, health concerns for children and animals exist, as dog fouling contains fecal bacteria (*Salmonella*, *E.coli*), parasites (*Cryptosporidium*, *Giardia*) and worms<sup>88</sup>. In order to tackle this problem, certain cities, such as Dresden in Germany and Petah Tikva in Israel have implemented interesting initiatives for waste management solutions<sup>89</sup>. Namely, city DNA databases are formed from reference DNA profiles obtained from cheek swabs of all registered city dogs. Dog fouling found on public spaces is then sent for analysis and DNA profile compared to the ones in the register; upon dog identification, the owner is fined. A similar solution for pet waste management was proposed in Great Britain in 2012<sup>90</sup>.

The same idea has spread to commercial settings as well, to hold responsible dog owners who do not clean their dog's waste. For this purpose, simple-to-use kits have been developed, such as DogPileID<sup>91</sup> and PooPrint<sup>92</sup>. Increasing number of residential properties are taking advantage of these modern technologies. Dogs of new residents are swabbed for cheek cells and the sample sent off for DNA analysis. This allows creation of the community canine DNA database. Upon unclaimed fouling instance, the waste is scooped and sent for DNA analysis. Residential property management can log into the system and perform online DNA profile comparisons for specific dog identification. Irresponsible owner is then held responsible for the cost of performed DNA analyses<sup>93,94</sup>. Interestingly, this waste management solution appears to be preventive in its nature, since communities often report almost no dog fouling present once the system is implemented<sup>95</sup>.

Although routine canine DNA analyses and canine databases are not cheap, dog fouling waste collection services are not either.

### CONCLUSIONS AND FUTURE WORK

Despite significant work that has been done in canine DNA forensic investigations in the past years, great variability between laboratories exist and firm international standards and har-

83 Rhee, F. (2013, September 1). UC Davis lab takes CSI to the next level by helping police catch killers through pet DNA. The Sacramento Bee. Retrieved December 29, 2013, from <http://www.sacbee.com/2013/09/01/5693606/uc-davis-lab-takes-csi-to-the.html>

84 [http://pooprints.com/images/pdf/PooPrints\\_Community\\_Presentation\\_2013\\_web.pdf](http://pooprints.com/images/pdf/PooPrints_Community_Presentation_2013_web.pdf)

85 Kargl, R. (2005, July 19). A Pooper Scooper Law with Bite. Popular Science. Retrieved December 29, 2013, from <http://www.popsci.com/scitech/article/2005-07/pooper-scooper-law-bite>

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87 U.S. Environmental Protection Agency. (2012, December 5). Pet Waste Management. Retrieved December 29, 2013, from <http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=4>

88 [http://pooprints.com/images/pdf/PooPrints\\_Community\\_Presentation\\_2013\\_web.pdf](http://pooprints.com/images/pdf/PooPrints_Community_Presentation_2013_web.pdf)

89 <http://www.021.rs/Info/Svet/Jerusalim-Protiv-pseceg-izmeta-preko-DNK-pasa.html>

90 <http://www.telegraph.co.uk/news/newstopics/howaboutthat/9148384/Dog-mess-could-be-subjected-to-DNA-testing-under-plans-being-considered-by-a-council.html>

91 <http://www.vgl.ucdavis.edu/services/dogpileid/>

92 <http://www.pooprints.com/>

93 Golgovski, N. (2011, June 28). DNA tests provide the poop on bad dog owners. CNN. Retrieved December 29, 2013, from <http://www.cnn.com/2011/US/06/27/new.hampshire.dog.dna/>

94 Johnson, S. (2013, November 11). Fight over dog feces DNA testing continues. News4. Retrieved December 29, 2013, from <http://www.news4jax.com/news/fight-over-dna-testing-dog-feces-continues/-/475880/22924154/-/yswlb4z/-/index.html>

95 <http://www.the-review.com/ap%20general%20news/2013/11/27/dog-doo-scofflaws-get-bagged-through-dna-testing>



monization of protocols and procedures do not exist. It is challenging, timely and costly, for laboratories to begin performing canine DNA analyses which would require them to develop new in-house procedures<sup>96</sup>. This may improve with recent development of Finnzymes<sup>97</sup> and DogFiler<sup>98</sup> kits for commercialization.

In the forensic scientific community, it will be vital to determine appropriate STR markers (informative loci that could be successfully processed in multiplexes), internationally recognized allele nomenclature, allelic ladders, publicly available databases and quality control and quality assurance<sup>99</sup>.

Although forensic canine DNA analysis already contributed to solving many crimes, it continues to be underutilized and could be exploited to a much greater extent. A big limiting factor presents the fact that investigators do not routinely collect animal evidence at crime scenes, despite the fact they are potential sources of DNA and important evidence. Future guidance and awareness into collecting all types of potential DNA sources is expected to improve the current status of canine DNA forensic work.

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## INFLUENCE OF PITCH VARIATION ON VOICE MAP AND THE SOLUTIONS TO IT

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**Abstract:** Audio-visual material is the new form of evidence in procedural law. Phonetic identification is one of the most important parts of forensic science. The pitch is one of the most important parameters of speech; it is also one of the main features of the suspected speech. In the process of collecting phonetic evidence, we always discover that the conditions of sampling rate are different, especially when the emotional state of speaker is unstable; this makes the obvious change of pitch. Based on the above issues, we used comparison of sound spectrograms and statistics to explore what was the influence of the pitch change on the sound spectrograms and the measurement of formants. The final conclusion of the study will have positive effect on the job of phonetic identification.

**Keywords:** Voice, Spectrum, Forensic science, Pitch, Formant.

### INTRODUCTION

Voice is a sort of sound, which is a sense of verbal material carriers. Voice is formed on the glottal wave which is modulated by sound channel; there is an important parameter to measure the properties of the glottal wave, also called the pitch<sup>1</sup>. As the most important one of the acoustic features in the field of judicial phonetic identification, the pitch has indispensable value of application in speaker identification work. There is obvious difference in pitch because of the tension of emotions and other factors. It determines the basic law of the speaker's individual characteristics. The pitch is changing as the individual ages because of the growth and development of vocal cord. The tone fluctuates frequently because of the influence of the psychological and emotional factors, which is due to the change of pitch. In the process of collecting samples, we found that the speaker's pitch changes obviously, which is a significant phenomenon. It is due to the nervousness of the suspects in crime, for example: When the kidnappers call the victim's family to ask ransom, the speaker often feels confused and stressed. In order to intimidate the victim's family, the suspect's "tone" will be improved deliberately. In addition, sometimes suspects will use some types of hardware and software deliberately to change the voice frequency properties during the speaking process or the later processing procedure in order to cover up their pronunciation feature.

The speech's pitch in case has more obvious changes in addition to the above. When a person answers the police question, whatever the speaker's attitude or mood is not the same as one in the criminal process, the changes of pitch brings a lot of obstacles to the visual inspection. The suspect's pitch is passively changed; its main features are reflected in the changes of value (one high and one low). The pitch of speech samples is often higher in crime, while the pitch is lower when the suspect is interrogated. The significant differences between the speakers' pitches will have influences inevitably on voice map, and they would also bring about a lot of difficulties to judicial speech test. For exploring the influence of pitch changes on the voice map, and the method to restore the changed map, we have done a lot of researches, which has not been conducted to comprehensive analysis of experiment in the judicial field.

In this paper, we use the conventional voice analysis software to make a series of studies on voice samples with the pitch changed greatly, and investigate how variation of the pitch affects the maps of voice. On this basis, we have found a solution to improve the reliability of the measured values, thus providing the reference for related work in judicial speech test.

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<sup>1</sup> Cui Jingxu. Audio-visual Materials Examination [M]. China Shenyang: The textbook of China Criminal Police University, 2004.

## ANALYSIS OF THE PITCH APPLICATIONS

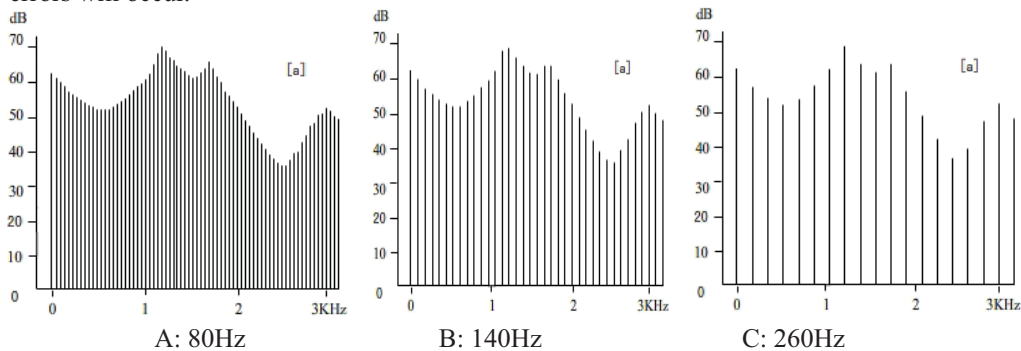
The relationship between pitch and voice

We can touch the movement of the vocal cord by hand during the pronunciation. The adult male vocal cord size is similar to a fingernail; it vibrates and generates source wave of speech caused by the airflow from the lungs, called the glottal wave. The glottal wave is a sort of complex wave; we can break up the glottal wave into base band and a series of harmonics by using the Fourier transform<sup>2</sup>. If the pitch is  $F_0$ , the second harmonic and the third harmonic are  $2F_0$  and  $3F_0$ , in turn. It means that the glottal wave contains various monochromatic waves.

The glottal wave is only the source of voice. It does not have any meaning of speech, but we can decompose the glottal base band into  $F_0$  (sometimes also called the first harmonic) and a series of harmonics by using the Fourier analysis<sup>3</sup>. Obviously, the pitch and its harmonics are the origin of constitution of speech.

## THE PITCH CHANGE INFLUENCE ON SPECTRUM

Since there is a direct relationship between the level of the pitch and distribution of intensity of its harmonics, the spectral analysis is the distribution of the harmonic in effective energy range of speaker. Therefore, changes in the level of the pitch will have some influences on the distribution of spectrum. Fig.1 shows the spectrum of vowel (/a/), the distinction between the three is that the pitch is different. As shown in the pictures, the value of the pitch is divided into low, normal and high. In the spectrum with very low pitch, we can almost see the perfect shape of F1, F2 and F3; the spectrum with normal pitch can show the shape of F1, F2 and F3, but the spectrum with higher pitch cannot easily show the shape. If we try to distinguish the F1, F2 and F3 from the vowel (/a/), we will relatively draw the wrong conclusions. It is even more difficult to separate the F1 and F2. Usually the highest point of the line is called the spectral envelope; the spectral envelope is able to display a resonance peak built by the harmonics. Fig.1 shows that a low-frequency base band and a normal group can give a better spectral envelope, while the higher frequency group cannot give an almost decent spectral envelope. The distance between each component becomes larger, which increases the distance between the harmonics. Hence, if we use a high frequency spectrum or envelope to measure the related numerical, large errors will occur.



A: 80Hz B: 140Hz C: 260Hz  
 Fig.1 Different pitch value corresponding to frequency spectrum distribution condition

<sup>2</sup> Nolan.F. The Phonetics Bases of Speaker Recognition [M].Cambridge University Press,1998.

<sup>3</sup> Jerng and C. G. Sodini, "The Impact of Device Type and Sizing on Phase Noise Mechanisms", IEEE Journal of Solid-State Circuits, vol. 40, no. 2, pp. 360-369, 2005.

## COMPARISON OF NARROWBAND SPECTRUM OF THE SPEECH WITH DIFFERENT PITCH

Formant is an energy concentration area constituted by a plurality of harmonics<sup>4</sup>. The intensity of the harmonic distribution affects the concentration of resonant peak energy directly. In other words, it will affect the bandwidth of the formant. Therefore, the pitch changes up and down, which will bring a lot of difficulties in analyzing broadband and narrowband sonogram in later visual inspection. Fig.2 demonstrates the distribution of the harmonic energy from the speech with very high pitch.

As it can be seen in the figure, the broadband and formant spectrum with high pitch is not conducive to measure. When the speaker intentionally camouflages during the process of pronunciation, the speaker's pitch will often become high or higher. The suspects often change the tension of his vocal cords in order to change their pronunciation feature during the process of pronunciation. In addition, they also use voice-changer software and hardware (etc.) to achieve purposes of rising or reducing the pitch, which will bring many difficulties to the upper inspection and appraisal<sup>5</sup>. Therefore, the viable treatment method needs to be included, improving the voice maps with abnormal pitch, and then can be used to draw a correct conclusion.

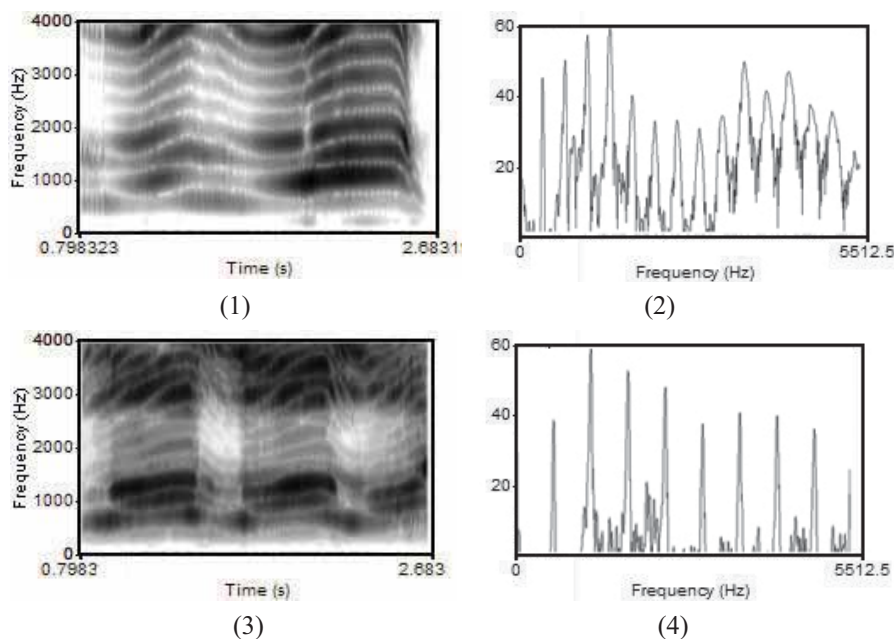


Fig.2 The broadband spectrogram and the frequency spectrum from the voice with high pitch (e/'e/'e/) The first map and second map are made from a two-year-old girl,  $F_0=480$  Hz; the third map and fourth map are made from a twelve-year-old girl,  $F_0=380$ Hz

## EXPERIMENT AND ANALYSIS

We chose different speakers who spoke in different pitch value to build speech database; and then we used several methods to measure the value of formants. At last, we put the value of formant from the normal pitch pronunciation as a reference, and tried to use software with the functions of parameter for tuning the high pitch speech become normal.

<sup>4</sup> Hollien, H. Forensic Voice Identification [M].Academic Press, New York, Tokay, London, 2002.

<sup>5</sup> Philip Rose, Forensic Speaker Identification[M].Taylor Francis, New York, 2002.



## The experimental corpus and design

During the process of this experiment, we chose four men, four women and two children as speakers. These people spoke out 50 syllables separately in both normal and camouflaged way, and then we built ten speech databases. We called these speech databases m1\m2\m3\m4\w1\w2\w3\w4\t1\t2. In the recording period, we asked speakers to control vocal state for making the pitch of each pronunciation rise successively. The audio files were mono, audio sample rate was 11025Hz, and digitalizing bit was 16 bit. We recorded these audio files in recording studio in order to guarantee high signal to noise.

## The experimental result and analysis

### Analysis on the data from the voice with different pitch

In this experiment we used the normalized method. Normalization was a simplified calculation method; the parameters with dimensions would be converted into the dimensionless parameters and became scalars by this method<sup>6</sup>. This method was used in a variety of calculation. It was a dimensionless processing method, which turned the absolute value from physical experiment into relative values, and then simplified the calculation and reduced the amount of value<sup>7</sup>.

In order to analyze the change scope of pitch directly, we chose the lowest pitch in the speaker's speech databases as reference. The pitch value of other pronunciations would be normalized and then we could obtain the changing depth of pitch represented by  $\Delta F_n$ . As shown in Table 1, we selected some syllables in the database m1, and calculated the changing depth of each pitch, then made the data into the Table1.

Pitch (Hz) Syllable	Pitch				$\Delta F_{02} =$	$\Delta F_{03} =$	$\Delta F_{04} =$
	$F_{01}$	$F_{02}$	$F_{03}$	$F_{04}$	$F_{02}/F_{01}$	$F_{03}/F_{01}$	$F_{04}/F_{01}$
1	120	161	216	266	1.34	1.80	2.22
2	106	146	184	236	1.38	1.74	2.23
3	118	155	204	256	1.31	1.73	2.17
4	113	144	184	236	1.27	1.63	2.09
5	118	158	203	250	1.34	1.72	2.12

Table 1 Different pitch and changing depth

Table 1 illustrates that  $F_{02}$  is distributed around 1.30,  $F_{03}$  is distributed between 1.5 and 1.8, and  $F_{04}$  is located between 2.09 and 2.23.  $F_{02}$  is stable. According to such values, we know that the row of pronunciation state is close to the people speak normally. This row of syllable parameter which corresponds to formant is correct, and this can be set as standard.  $F_{04}$  is unstable and undulation. This shows that pronounce is not stable, and we can set this as upper limit. Majority of statistics in  $F_{04}$  exceed 2.0, and it is far away from the normal speaking condition, so camouflage is obvious.

### The pitch change influence on the higher-order formant

Fig.3 shows the wideband spectrogram of /san/in m1. When the value of pitch is very low ( $F_0=118$  Hz), only the first formant and the second formant appear in the map from vowel (/a/),

<sup>6</sup> Zhou Wenzhen, "A Modified Electronic Ballast Circuit with Extended Conduction Time", IJACT: International Journal of Advancements in Computing Technology, vol. 4, no. 3, pp. 133-140, 2012.

<sup>7</sup> Ren Guocan, Wang Songliang, Shao Hua, "The Study on Embedded Memory Circuit Design in Low-power SoC Chips for Mobile Systems", IJACT: International Journal of Advancements in Computing Technology, vol. 4, no. 1, pp. 155-162, 2012.



which cannot help us providing more information. All formants of /a/ are completely displayed by wideband spectrogram of  $F_{02}$  ( $F_{02}=155$  Hz), the wideband spectrogram of  $F_{04}$  ( $F_{02}=290$  Hz) shows “feminine characteristics”, the higher-order formant becomes gradually clearer with the pitch increasing.

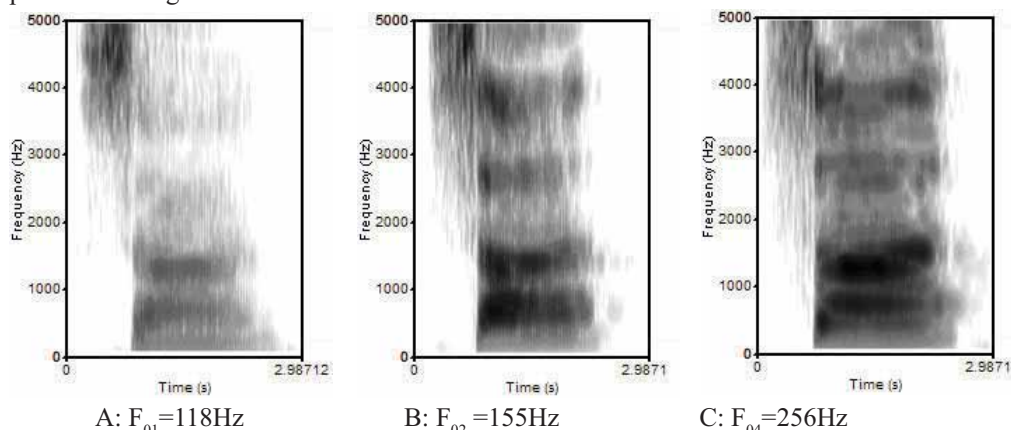


Fig.3 The wideband spectrogram from \san\ in ml

The main reason is when pitch becomes higher, original parameter setting of normal phonetic analysis software cannot work anymore.

The criminal’s organs for pronunciation become muscular tension when camouflaged by reducing pitch. The speaker must increase the intensity of pronunciation, and then the overall energy of speech will be enhanced. This will enhance the harmonic attenuation under normal circumstances, especially in the high frequency region where originally weak energy becomes obvious, making the formant spectrogram being apparently changed. When the pitch is reduced, the organs of pronunciation become muscular relaxation. The speaker must reduce the intensity of pronunciation, and then the overall energy of speech will be weakened. These will weaken the harmonic attenuation under normal circumstances, especially in the high frequency region. Therefore, decreased pitch often leads to reduction of energy, and finally leads to a lack of higher-order formant.

### The pitch change influence on lower-order formant

In Table 2, we can see that the values of F1 were obtained through three different measure methods. With the increase of the pitch and gradual rise, F1 rises regularly, especially when we use more visual examination and measure of frequency spectrum. In accordance with general knowledge of phonetics, when male pronounce vowel /i/, the first formant is located around 250 Hz. Male’s pitch is normally distributed between 100 Hz and 200 Hz. Since the pitch and first formant are close, there is a low energy band at timer shaft.

### The pitch change influence on acoustic parameters measurement

Visual method means that the staff estimates formant using visual method according to the height of formant in the voice maps of PRAAT software. As it can be seen from Table 2, the formant value from four pronunciations basically increases as the frequency increases. However, the fourth formant from  $F_{03}$  and  $F_{04}$  (about 3500 Hz) are not in agreement with the fourth formant of  $F_{02}$ . The reason lies in the pitch from the two groups of pronunciation, as these are too large, with the advent of the harmonic in the voice map; the error will easily come out by visual method.

Numerical method refers to the measurement of the value of formant by using PRAAT software. Table 2 provides the average of formant. Fig 4A shows that the digital tracks from F1 and F2 are obvious; the digital tracks from F3 and above are not obvious. However, software still provides the result of high-order formant. The reliability is imagined. Fig 4B shows that four tracks of formant are obvious, the numerical results are believable. We know that the effect of “burr” on the fourth formant is the biggest by comparing the data from Table 2.

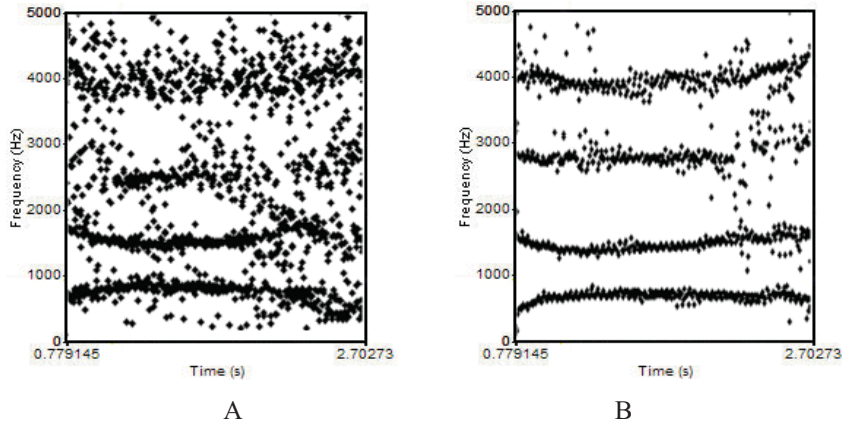


Fig.4 The numerical curve of formant corresponding to two kinds of pitch

Spectral method refers to determination of the formant according to the relative maximum harmonics in the frequency spectrogram of the PRAAT software. The data in Table 2 are selected from some harmonics by the observers according to the basic knowledge of phonetics. It shows that the value of higher-order formant is not reliable when using spectral method<sup>8</sup>.

When we use ocular estimation to measure the central target value of formant roughly, with increasing of pitch, these formants of four pronunciations will increase. When pitch is on the high side, we find out that statistics of formants is not correct obviously by visual inspection. When we use software to measure statistics of formant, measuring error of low pitch is obvious. With increase of pitch, all formant trajectories are firstly cleared, and then begin to appear burr phenomena on the edge of higher-order formant, especially the fourth formant.

Formant \ Number		Number			
		F <sub>01</sub> (Hz)	F <sub>02</sub> (Hz)	F <sub>03</sub> (Hz)	F <sub>04</sub> (Hz)
Visual method	F1	363	461	519	688
	F2	2273	2467	2476	2428
	F3	3286	3247	3344	3260
	F4	4007	3626	3792	3550
Numerical method	F1	318	326	352	360
	F2	2191	2343	2362	2414
	F3	3320	3321	3149	3190
	F4	4075	3886	3581	3694
Spectral method	F1	260(2)	317(2)	415(2)	548(2)
	F2	2229	2384	2413	2394
	F3	3345	3360	3289	3213
	F4	3965	3515	3726	3479

Table 2 The measurement of the formant value from /yi/ in *m1*

<sup>8</sup> Kurachi, S.; Yoshimasu, T.; Itoh, N.; Yonemura, K.; , "5-GHz Band Highly Linear VCO IC with a Novel Resonant Circuit", 2007 Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems, pp.285-288, 2007.

In a word, changes of pitches affect the measure of formant. Generally, with the increase of pitch, formants are also increased. When the value of pitch is very low, it will cause the resonance peak deletion, which is well reflected in these three methods; high pitch values will produce feminine map, which will affect the vision measurement<sup>9</sup>. In such three test methods, the numerical results of low-order formant measured by using spectral method are not reliable. In order to solve such problem, this paper discusses the adjustment of bandwidth of high feminine map.

## **THE PROCESSING METHOD FOR THE VOICE MAP WITH CHANGING PITCH**

### **Method of adjusting bandwidth**

For example, when M1 speaks /san/, the speaker's second pronunciation is close to the normal pronunciation. Results of visual method tell us, as the impact of some high frequency harmonic waves, that the fourth formant is lower than it is in what we get normally, so we need to use high frequency sub harmonic. We can place window length in the "0.002" by adjusting the option "Spectrogram settings" in the PRAAT software<sup>10</sup>. We could get the value of formant (804 Hz/1354 Hz/2638 Hz/3669 Hz) from the adjusted approximation of the wideband spectrogram. Before the adjustment, there are big differences between the fourth formant of F04 and F02, but the measurement is the same as the value of F02 was adjusted.

### **Method of adjusting the parameter "Change gender"**

We can work out the pitch's average of pronunciation from m3 by adjusting the parameter "Formant shift ratio" and "New pitch median" in "Change gender". The first is 109 Hz, and the fourth is 228 Hz. By adjusting the option "New pitch median" in "change gender" to 109 Hz, we can make the pitch of the 2nd pronunciation and the normal pronunciation equally. Secondly, the average value of third and fourth formant is only the equivalent of the 94 % of fourth pronunciation. By adjusting "Formant shift ratio" in the option "Change gender" to 0.94, we can get the measurement results before and after adjustment, as shown in Table 3.

Table 3 shows that:

For the voice with pitch changing, we just need to adjust the software PRAAT and set the new pitch median to the value of normal pronouncing pitch. The voice maps showed that the pitch of adjusted pronunciation is much closer to the pitch of first pronunciation. However, the formant of adjusted pronunciation didn't change obviously. We adjusted formant shift ratio in the software, and moved the voice according to the corresponding proportion. The data extracted from the voice maps show that the value of formant from the adjusted pronunciation is much closer to the value of formant of first pronunciation. However, the pitch of adjusted pronunciation didn't change obviously. When we changed phonetic pitch and moved the formant, we found that phonetic pitch and formant was closed to the samples that we got first time. This kind of method had a problem, when the function of formant shift ratio and new pitch median is adjusted; the sound samples have already been changed. If it is possible to make samples which were handled by this method as court, evidence still remains questions. We need further study and discussion.

<sup>9</sup> L. Lei, G. Zhichao, L. Youchun, M. Hao, T. Zhangwen, "A 975-to-1960MHz Fast-Locking Fractional-N Synthesizer with Adaptive bandwidth control and 4/4.5 prescaler for digital TV tuners", IEEE International in Solid-State Circuits Conference, pp. 396-397, 2009.

<sup>10</sup> Xiong Ziyu. Manual of PRAAT(voice soft) [M]. Beijing: China Language Institute of the Academy of Social Sciences, 2004.

Syllable		F0	F1	F2	F3	F4
1/yi/	The first pronunciation	120	261	2231	3317	4085
	The fourth pronunciation	269	395	2500	3517	4306
	New pitch median:109.1	120	397	2474	3456	4289
	Formant shift ratio:0.94	270	292	2264	3369	4154
	(109.1, 0.94)	120	301	2269	3368	4166
2/er/	The first pronunciation	116	679	1130	2382	3066
	The fourth pronunciation	240	845	1330	2600	3435
	New pitch median:109.1	114	823	1357	2578	3416
	Formant shift ratio:0.94	239	712	1175	2432	3142
	(109.1, 0.94)	113	701	1165	2426	3154
3/san/	The first pronunciation	119	710	1330	2350	3551
	The fourth pronunciation	257	795	1465	2860	3884
	New pitch median:109.1	115	783	1431	2823	3829
	Formant shift ratio:0.94	257	741	1374	2412	3580
	(109.1, 0.94)	115	721	1357	2421	3521

Table 3 The measurement results before and after adjustment

## CONCLUSION

We establish the speech corpus for different pitches, and use some methods to analyze what is its influence on measuring formant and voice map when we change the pitch. It can be concluded that when the pitch is low, the higher-order formant is weakened phenomenon obviously, and even disappears. When the pitch is high, it sounds like women. Broadband spectra also conform to character of women's voice. In the aspect of measuring formant, when pitch becomes very low or high, the measuring will be incorrect, especially when we use spectrogram to measure formant in low frequency range, it will be incorrect obviously.

In addition, as pitch rises, lower-order formant (especially F1 and F2, which are lower than 1000 Hz) appears to have a rising trend. By adjusting the parameter (Window length) of the option "Spectrogram settings" in PRAAT software, we can improve the quality of broadband spectra with higher pitch which is close to normal sonogram. Through adjusting the parameter "Change gender" in PRAAT software, the value of all formants with higher pitch is closer to the voice with lower pitch, but this method changed the sound samples, and its operability needs to be further studied.

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## COMPETITIVE STATUS OF COUNTRIES IN NANOTECHNOLOGY – CONSIDERING THE IMPORTANCE OF FORENSIC APPLICATIONS OF NANOTECHNOLOGY<sup>1</sup>

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*„Nanotechnology is the future of forensic sciences“<sup>2</sup>*

**Abstract:** Nowadays nanotechnology is considered as a very promising research area, judging by the increase of nanotechnology activity levels and a higher level of commercialization of nanotechnology innovations, to which less developed countries have also made their contribution. Economic effects of applied research into nanotechnology (including nano-forensic<sup>3</sup>), the growth of the market value and the number of nanotechnology products, as well as an increase in the number and strength of competitors (countries and other market participants in this field) have turned nanotechnology into a topical research area in the field of economic science. In that respect, in this study we have defined competitive status of countries in nanotechnology.

**Keywords:** competitive status of countries, nanotechnology, nano-forensics.

*JEL classification* M21, M31, R12

### INTRODUCTION

The origin of nanotechnology is associated with the year of 1959 and physicist Richard Feynman.<sup>4</sup> The term ‘nanotechnology’ was first used by the University of Tokyo professor Norio Taniguchi in 1974. Taniguchi described the revolutionary possibilities of application of materials in ultra small dimensions of less than a billionth meter.<sup>5</sup> Eric Drexler<sup>6</sup> gave his contribution in shedding light on the phenomenon of ‘nanotechnology’ by exploring it more closely during the 80s of the 20th century. A key stimulus to further development of nanotechnology was provided by the inventions in the 80s of the 20th century which were rewarded by the Nobel Prize in Physics -1986. Since then, they have gained increasing importance.

Nanotechnologies have become a challenge for many governments<sup>7</sup>, their research institutions and organizations, institutes, colleges and universities, large, medium and small companies, i.e. the entire public and private sector, and society as a whole, taking into consideration their positive effects. The Republic of Serbia has also recognized that the scientific and research development

<sup>1</sup> The work presented here was supported by the Serbian Ministry of Education, Science and Technological Development (project III 45003 and project III 44006).

<sup>2</sup> Chen, Y., (2011). „Forensic Applications of Nanotechnology“. *Journal of the Chinese Chemical Society*, 58 (6), 828-835, p. 834.

<sup>3</sup> Nano-forensics - a completely new area of forensic science associated with the development of nano-sensors for real-time crime scene and terrorist activity investigations by determining the presence of explosive gases, biological agents and residues. Farrukh, M. (2011). „Nano-Forensics: Applications of Nanotechnology in Forensics“. Chemistry Week: Duncicliff Chemical Society. Retrieved 1 September 2013 from the site <http://www.chemistry2011.org/system/documents/274/original/Nano-Forensics.pdf?1333094269>

<sup>4</sup> Feynman, R. (1960). „There’s Plenty of Room at the Bottom“. *Engineering and Science Magazine*, 2 (5), 22-36. USA: California Institute of Technology.

<sup>5</sup> The Foresight Institute. (2013, January). *A Short History of Nanotechnology*, Retrieved 22 Juny 2013 from the site <http://www.foresight.org/nano/history.html>

<sup>6</sup> Drexler, E. (1986). *Engines of Creation: The Coming Era of Nanotechnology*. USA: Anchor Books Edition. Retrieved 9 November 2012 from the site [http://xaonon.dyndns.org/misc/engines\\_of\\_creation.pdf](http://xaonon.dyndns.org/misc/engines_of_creation.pdf)

<sup>7</sup> Roco, M. (2011). “The long view of nanotechnology development: the National Nanotechnology Initiative at 10 years“. *Journal of Nanoparticle Research*, 13 (2), 427-445. doi: 10.1007/s11051-010-0192-z.



is the basis of the innovation potential of the country. Therefore, it has adopted the strategy of scientific and technological development for a particular period of time. In the strategy of scientific and technological development for the period 2010-2015 the Republic of Serbia has also included nanotechnology as one of the priority areas of research and development.

Nanotechnology is widely applied. In addition, scientists are working at nanotechnology applications that may steer the power of forensics. Many new nanoscale sample analysis techniques in genetic, medicine, analytical chemistry have been applied to fields of forensic sciences.<sup>8</sup> Among the various nanotechnologies, nano-analysis is most commonly seen in forensic science with instrumentations including transmission electron microscope, scanning electron microscope, atomic force microscope and Raman microspectroscopy.<sup>9</sup> Nanotechnology products have a prominent place in the global market and significantly compete with products of the developed or less innovative technologies. BCC Research estimates that total U.S. sales of forensic products and services were nearly 10,1 billion \$ in 2010 and that sales will grow at a 9,4% compound annual growth rate through 2016 to more than 17 billion \$. Apart from computer forensics and forensics accounting, the largest segments of the forensics market are DNA testing and fingerprinting/biometrics.<sup>10</sup>

Economic effects of applied research into nanotechnology, the growth of the market value and the number of nanotechnology products, as well as an increase in the number and strength of competitors (countries and other market participants in this field) have turned nanotechnology into a topical research area in the field of economic (social) science.<sup>11</sup> In that respect, in this study we have defined competitive status of countries in nanotechnology. However, nanotechnology also has negative effects, and the negative economic and social effects of nanotechnology, along with the positive ones, have soon become a topical research area of many papers<sup>12</sup> and reports of specialized institutions<sup>13</sup>.

## METHODOLOGY

We have begun research in this paper by the collection and preliminary analysis of data on individual parameters of the level of nanotech activity and the level of commercialization of nanotech innovations in the observed countries in the last decade of the 20th century. In the group of individual parameters of the nanotech activity level we observed a national nanotechnology initiative and national nanotechnology centers, national nanotechnology programs/plans for research and development, the scope and structure of the investment, and the number of nanotechnology publications and patents. In a group of individual parameters of the level nanotechnology commercialization of innovations we observed nanotech companies and other institutions and organizations in number and size, the nanotech products in number and country of origin, the level of commercialization of innovations in nanotechnology areas and product categories, and income of countries on the nanotechnology products markets.

The observed countries were divided into two groups. The first group consisted of countries that have already reached significant results in the field of nanotechnology at global level (The

<sup>8</sup> Brettell, T. A., Butler, J. M., Saferstein, R. (2005). "Forensic science". *Anal. Chem.*, 77 (12), 3839-3860.

<sup>9</sup> Chen, Y., *op. cit.*, p. 828.

<sup>10</sup> BCC Research. (2011, May). *Report Highlights*. Retrieved 9 September 2013 from the site <http://www.bccresearch.com/market-research/safety-and-security/forensic-technologies-new-growing-markets-sas003d.html>

<sup>11</sup> Shapira, Ph., Youtie, J., & Porter, A. (2010). „The Emergence of Social Science Research in Nanotechnology“. *Scientometrics*, 85 (2), 595-611. doi:10.1007/s11192-010-0204-x.

<sup>12</sup> Hullman, A. (2006). "The economic development of nanotechnology - An indicators based analysis". European Commission. Retrieved 4 December 2012 from the site [http://nanotech.law.asu.edu/Documents/2009/09/The%20economic%20development%20of%20nanotechnology%20-%20an%20indicators%20based%20analysis\\_220\\_7306.pdf](http://nanotech.law.asu.edu/Documents/2009/09/The%20economic%20development%20of%20nanotechnology%20-%20an%20indicators%20based%20analysis_220_7306.pdf); Roco, M., & Bainbridge W. (2005). "Societal implications of nanoscience and nanotechnology: Maximizing human benefit". *Journal of Nanoparticle Research*, 7 (1), 1-13. doi: 10.1007/s11051-004-2336-5; Youtie, J., Porter, A., Shapira, Ph., Tang, L., & Benn, T. (2011). „The Use of Environmental Health and Safety Research in Nanotechnology Research“. *Journal of Nanoscience and Nanotechnology*, 11 (1), 158-166. doi:10.1166/jnn.2011.3840; Roco, M., Mirkin, Ch., & Hersam, M. (2011). "Nanotechnology Research Directions for Societal Needs in 2020: summary of international study". *Journal of Nanoparticle Research*, 13 (3), 897-919. doi: 10.1007/s11051-011-0275-5.

<sup>13</sup> Seear, K., Petersen, A., & Bowman, D. (2009). "The Social and Economic Impacts of Nanotechnologies: A Literature Review". Final Report, February. Australia: Monash University Victoria. Retrieved 22 December 2012 from the site [http://www.innovation.gov.au/Industry/Nanotechnology/NationalEnablingTechnologiesStrategy/Documents/SocialandEconomicImpacts\\_LiteratureReview.pdf](http://www.innovation.gov.au/Industry/Nanotechnology/NationalEnablingTechnologiesStrategy/Documents/SocialandEconomicImpacts_LiteratureReview.pdf)



U.S., the EU countries, primarily Germany, the UK and France, Japan, South Korea, China, Taiwan, Singapore and Israel). The second group consisted of countries that have achieved some, but still not enough globally significant results in this area Canada, Russia, Italy, Thailand, Hong Kong, Vietnam, Malaysia, Indonesia, India, Australia, and New Zealand.

In the first phase of the study we collected secondary data from external sources. In this regard annual and interim reports and publications of general and specialized nature, scientific papers in journals from the SCI list and other results published on the Internet should be singled out. The above sources are, partially or fully, publicly available on the official websites of the observed countries' governments and their bodies, specialized research institutions and organizations, scientific research institutes and universities. Among the most important are the National Nanotechnology Initiative of the U.S. and other countries, the European Commission, the Cientifica research institution, Lux Research, OECD, EPO and USPTO databases.

After the first phase of research, we concluded that we could not rely on the results obtained from a partial observation of individual parameters of the level of nanotechnology activity and the level of commercialization of nanotechnology innovations. The reason is that nanotechnologies in the observed countries are too differently defined to give valid and comparable results of the analysis based in this way. This is supported by a lack of common standards of all individual parameters of the level of national nanotechnology activity and the level of commercialization of nanotechnology innovations in the observed countries. In this regard, we could not accept statistics and other quantitative indicators of the development of nanotechnology which are published by the government or national nanotechnology institutions and organizations of particular countries as comparable indicators for the needs of comparative analysis. We based research on representative, valid and available research findings on the countries' ranking in nanotechnology by Lux Research<sup>14</sup>.

## DATA AND ANALYZES

According to Kotler, Vong, Sonders, Armstrong<sup>15</sup> market concept of competition recognizes several competing groups which are defined from the point of view of the market needs that they meet. Among the more important are: leaders, challengers, followers and nichers or tamponers. The matrix of the level of nanotechnology activity/the power of technological development<sup>16</sup> presents the competitive groups of countries in nanotechnology and a competitive status of each country (Figure 1).

The level of nanotechnology activity	5	The competitive group of challenger-countries  The status of a challenger	The competitive group of leader-countries  The status of a leader
	3	The competitive group of follower-countries	The competitive group of nicher-countries
	1	The status of a follower	The status of a nicher
		1	3
	The power of technological development		

*and their competitive status*

<sup>14</sup> Lux Research, USA. (2005). „Ranking the Nations: Nanotech's Shifting Global Leaders, Statement of Findings: Ranking the Nations:Nanotech's Shifting Global Leaders“. Burns, R. (Ed.). p. 4. Retrieved 9 November 2012 from the site [http://israelsciencetechnology.blogspot.com/files/lux\\_research\\_sof\\_nts-r-05-006.pdf](http://israelsciencetechnology.blogspot.com/files/lux_research_sof_nts-r-05-006.pdf); Lux Research, USA. (2010). „Ranking the nations on nanotech“. Hwang, D., (Ed.). Retrieved 4 December 2012 from the site <http://www.electroiq.com/articles/stm/2010/08/ranking-the-nations.html>

<sup>15</sup> Kotler, F., Vong, V., Sonders, Dž., i Armstrong, G. (2007). *Principi marketinga* (četvrto izdanje). Zagreb: Mate. p. 505.

<sup>16</sup> Lux Research, *op. cit.*

The leader countries are usually the creators of changes in nanotechnologies. The challenger-countries in nanotechnology are potential competitors to leader-countries in the level of nanotechnology activity. Specialization is the basis for successful engagement of countries in the group of nichers. They are potential competitors of leader-countries in the power of technological development, especially in the field of nanotechnology in which specialize. The follower-countries follow the challenger-countries in the level of the nanotechnology activity and nicher-countries in the power of technological development.

In a competitive group one country, a smaller or a larger number of countries can be positioned. If only one country is positioned, it has the initial differential advantage in the group. The closer the countries are positioned in a group, the stronger the competition, and the weaker the differential advantage, provided that it is manifested within the same parameter of nanotechnology activity or the power of technological development. According to Porter<sup>17</sup> competitive advantage is difficult to acquire and maintain especially in the field of high technology.

The largest number of the countries observed in this study adopted their first national nanotechnology research and development programs in the last decade of the 20th century. In 2001 the U.S. adopted the National Nanotechnology Initiative, Canada established a nanotechnology institute in Quebec, and Japan, South Korea, China and India adopted their five-year plans or programs of nanotechnology development. In 2002 the European Union adopted its sixth development program, and Australia and Israel included nanotechnology in their programs of technological development. Taiwan did the same in 2003, Singapore in 2006, and Russia in 2007.<sup>18</sup> Guided by this, we set the year of 2007 to be the first comparison year in determining the competitive status of countries in nanotechnology. We determine the year of 2009 as a second comparison year, which is at the same time the final year to date in which the ranking of countries in nanotechnology is presented.

In 2007, The United States, Japan, Germany, South Korea and Taiwan were placed in a competitive status of a leader. France was at the border between the leader- and the nicher-group. The United Kingdom was at the border between the challenger - and the follower-group. Canada was at the border between the nicher- and follower-group. Israel, Switzerland, Singapore and Sweden had the competitive status of a nicher. China, the Netherlands, Russia, Australia, Italy, India and Brasil had the competitive status of followers.<sup>19</sup>

All countries positioned in the leader-group, in 2008 and 2009 preserved the same level of nanotechnology activity, but not all preserved the power of technological development achieved in 2007. In 2008 compared to 2007 Japan significantly increased the power of technological development, while in 2009 compared to 2008 it decreased slightly. This decrease was of relative importance. It was the consequence of technology infrastructure improvement of competitor countries. During the whole observation period South Korea kept decreasing its power of technological development slightly. Germany improved its position in the group by increasing the power of technological development. Taiwan held the position it reached in 2007, thus becoming a serious competitor to the remaining countries in the group in technological development.<sup>20</sup>

The repositioning of the U.S. into the challenger-group was the consequence of a lower grade in only one parameter in the final grade of the indicator: the power of technology development. It is the number of university graduates of higher education in the scientific and technological field per capita. According to the findings of Lux Research<sup>21</sup> in this parameter the U.S. could lose advantage over Russia, Taiwan, South Korea and Singapore in the long-term. They are still considered one of the global leaders in nanotechnology and the initiators of research and development focus transition from nanocomponents to nanosystems. The differential advantage of the U.S. in the level of nanotechnology activity is sustainable in the long run, but their total differential advantage over their competitors in

17 Porter, M. (1990). "The Competitive Advantage of Nations". *Harvard Business Review*, 68 (march-april), 73-93, p. 73.

18 Albach, G. (2009). "Nanotechnology in Canada". Canada: Alberta. Retrieved 9 November 2012 from the site [http://www.mtycic.org/eventos/nano2009/Dr\\_Gary\\_Albach.pdf](http://www.mtycic.org/eventos/nano2009/Dr_Gary_Albach.pdf); Liu, L. (2009). Overview (Chapter 1). In Liu, L. (Ed.), *Emerging Nanotechnology Power - Nanotechnology R&D and Business Trends in the Asia Pacific Rim* (pp. 1-35). Singapore: NanoGlobe Pte Ltd, World Scientific Publishing Co Pte Ltd. Retrieved 4 December 2012 from the site [http://www.worldscientific.com/doi/suppl/10.1142/7224/suppl\\_file/7224\\_chap01.pdf](http://www.worldscientific.com/doi/suppl/10.1142/7224/suppl_file/7224_chap01.pdf)

19 Lux Reserach, 2010, *op. cit.*

20 *Ibid.*

21 *Ibid.*

the leader- and nicher-group is less viable. They need to make further effort to strengthen certain parameters of the power of technological development in order to maintain the overall differential advantage. Besides the U.S., China also reached the competitive status of challengers in 2008 by aggressive increase in the level of nanotech activity and the power of technological development.

In 2008 and 2009 the UK improved its position by increasing the level of nanotechnology activity, by which it was repositioned upwards from the border between the follower-group and the challenger-group into the challenger-group. France was positioned at the border between the nicher- and leader-group. The positioning of Canada at the border between the nicher and the follower group was enabled by investments in infrastructure and a focus on nanomaterials and nanoelectronics since 2002.<sup>22</sup>

In 2008 compared to 2007, Israel and Sweden retained their position in the group (nicher), while Singapore improved it by strengthening the power of technological development. Switzerland and Canada were repositioned to the follower-group, and France to the border between the challenger- and follower-group by decreasing the power of technological development.<sup>23</sup>

In 2009 compared to 2008, Israel improved its position moving up the ladder of nanotechnology activity. Sweden's position deteriorated, moving to the left of the ladder of the power of technological development, while Singapore retained its position considering both indicators. Switzerland was favorably repositioned by strengthening the power of technological development, and was located at the border with the group of followers. Strengthening the power of technological development was insufficient to put it back to its position from 2007.<sup>24</sup>

In 2008 compared to 2007, the position of the Netherlands and Australia worsened. In the case of the Netherlands it was by reducing the power of technology development, and in Australia by reducing both the power of technological development and the level of nanotechnology activity. Italy, Russia and Canada increased the level of nanotechnology activity, whereas Canada reduced the power of technological development. Italy and Russia, on the other hand, retained theirs. India maintained its position in the group, while that of Brazil deteriorated due to the reduction of the level of nanotechnology activity. It was positioned at the very border, which is the minimum grade for the level of nanotechnology activity that places the country among active countries in nanotechnology according to the methodology of Lux Research.<sup>25</sup>

France, Canada, the Netherlands, India and Brazil preserved their positions from 2008. Switzerland was repositioned to the right towards the border with the nicher- group due to the increase in the power of its technological development. In Russia and Italy the level of their nanotechnology activity increased, whereby Russia maintained the power of its technological development, while in Italy it was decreased. Australia also maintained the power of technological development, but the level of its nanotechnology activity decreased.<sup>26</sup>

In the last observed year the following countries had the competitive status of leaders: Japan, Germany, South Korea and Taiwan; the U.S., the UK and China had the competitive status of challengers; Israel, Singapore and Sweden - the competitive status of nichers; Canada, Russia, the Netherlands, Italy, Australia, India and Brazil - the competitive status of followers. The competitive status between the challengers and followers was occupied by France, and between the followers and nichers by Switzerland.<sup>27</sup>

## THE RESULTS

We defined four groups of competitor countries in nanotechnology. These are: the competitive group of leader-countries, the competitive group of challenger-countries, the competitive group of nicher-countries and the competitive group of the follower-countries, as well as the status of each country in the group. Each country seeks to protect (maintain) its position in the group first, then to improve it, and then to reposition towards the group of a higher status. The 'up and to the right' strategy has the greatest effect within each group (intragroup positioning) and between groups (intergroup positioning) (Figure 2).

<sup>22</sup> Albach, G., *op. cit.*

<sup>23</sup> Lux Reserach, 2010, *op. cit.*

<sup>24</sup> *Ibid.*

<sup>25</sup> *Ibid.*

<sup>26</sup> *Ibid.*

<sup>27</sup> *Ibid.*

The level of nanotechnology activity	<u>Competitive group of the challenger-countries:</u> the strategies of the position maintenance, the strategy of the position improvement in the group upwards and to the right, the strategy of repositioning towards leaders	<u>Competitive group of the leader-countries:</u> the strategies of the position maintenance, the strategy of the position improvement in the group upwards and to the right
	<u>Competitive group of the follower-countries:</u> the strategies of the position maintenance, the strategy of the position improvement in the group upwards and to the right, the strategy of repositioning towards challengers and nichers	<u>Competitive group of the nicher-countries:</u> the strategies of the position maintenance, the strategy of the position improvement in the group upwards and to the right, the strategy of repositioning towards leaders
The power of technological development		

Figure 2: The positioning strategy through competitive groups

All countries seek to improve their competitive position in the long-term, which could be achieved also in the short term (one year) by a combination of changes in the level of nanotechnology activity and the power of technological development in the following way: by changing these indicators in the same direction and with different intensity, or in the opposite direction and with different intensity.

The improvement of competitive position by a combination of changes in the level of nanotechnology activity and the power of technological development in the same direction and with different intensity is achieved by:

- the strategy of the more intensive growth of the level of nanotechnology activity than the growth of the power of technological development (the experience of China as a challenger country) and
- the strategy of the more intensive growth of the power of technological development than the growth of the level of nanotechnology activity (the experience of Singapore as a nicher country).

The improvement of competitive position by a combination of changes in the level of nanotechnology activity and the power of technological development in different direction and with different intensity is achieved by:

- the strategy of the bigger growth of the level of nanotechnology activity than the decrease of the power of technological development (the experience of Italy as the follower-country) and
- the strategy of the bigger growth of the power of technological development than the decrease of the level of nanotechnology activity (unrecorded experience of any country in this period).

If competitiveness is analyzed by nanotechnology fields or categories of products, the experience of the observed countries shows that they applied the strategy of the large scale and the focus strategy. The strategy of the large scale is applied by the countries aspiring to differential advantage in several fields of nanotechnology. The focus strategy is typical of countries aspiring to differential advantage in one or certain fields of nanotechnology in which they specialize, such as nanoelectronics, nanomaterials and nanobiotechnology (e.g. the nicher-countries). Nanoelectronics and nanomaterials are the most promising areas, while China is the fastest growing market for nanotechnology and nanotechnology products.<sup>28</sup>

<sup>28</sup> Shapira, Ph., & Wang, J. (2009). „From Lab to market? Strategies and issues in the commercialization of nanotechnology in China“. *Asian Business and Management*, 8 (4), 461–489. doi:10.1057/abm.2009.15; Tang, L., & Shapira, Ph. (2011). „Regional Development and Interregional Collaboration in the Growth of Nanotechnology Research in China“. *Scientometrics*, 86 (2), 299-315. doi: 10.1007/s11192-010-0274-9.

## CONCLUSION

In the last decade of the 20th century governments of many countries have significantly supported the development of nanotechnology through the increased funding and the creation of better conditions for innovation. The growth of global investment in nanotechnology continues to encourage the nanotechnology initiative of the countries making them remain promising areas of research in the field of natural, technical, technological, but also social and human sciences.

The economic importance of applied research in nanotechnology, strengthening of competition, the growth of nanotechnology products market value and number, especially of consumer goods, caused nanotechnology to become a challenge both for the scientific and professional community in the field of international marketing. In this regard, the topicality of the subject of research in this paper has received a full dimension.

The competitive status of countries in nanotechnology points to the achieved level of nanotechnology activity level and the power of technological development, and therefore to the indicator that represents the field of their differential advantage. Their competitive status is largely the result of national programs / plans of nanotechnology development, continuous nanotechnology activity and intensive technological development.

The competitive status in the group is relatively sustained during the analysis period, but once achieved, it does not guarantee remaining in the group. The strategy of maintaining a competitive status and position is realized by the protection of the achieved level of nanotechnology activity and the power of technological development. It is usually applied by the countries with a long-term differential advantage over other competitors in the group.

Major changes in competitiveness, i.e. in the number of countries in the group, and the level and intensity of their differential advantage are recorded in groups of the nicher-countries and follower-countries in relation to other groups.

The highest growth of the number of competitors was recorded in the group of challengers, to which China and the United States have contributed as new competitors in the group. The United Kingdom, Canada, France and Switzerland changed positions during the period, by moving from one group to another, or by positioning at the border between the two groups. During the observed period China made the biggest improvement of its position by joining the group of a higher status, and Russia by improving its position in the group of followers.

The established competitors are facing the challenges from the countries that are positioned in the same competitive group, the countries from competitive groups of a lower or higher rang, but also the new competitor countries. They pose a greater threat to the existing competitors, because the chances of quick identification of the new competitors in relation to the existing ones are lower. Also, the actions and strategies of existing competitors are more visible.

It was found that the countries maintained or improved status in the group, or repositioned to a higher status group differently and by means of different strategies.

The research results suggest an increase in competitiveness and the emergence of less-developed countries in the role of new competitors. They also suggest that the achieved competitive status is not sustainable in certain cases, even in the short run, mostly due to the offensive actions of competing countries and repositioning strategies by which they improve their status. In this regard, it is necessary to continually check the changes in the competitive status of countries in nanotechnology, forecast their strategies and publish the results so that the existing competitors could protect or strengthen their own status, while potentially new competitors could have an idea of the competitive structure seen through the market concept.

## LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

Nanotechnologies in the observed countries are too differently defined. This is supported by a lack of common standards of all individual parameters of the level of national nanotechnology activity and the level of commercialization of nanotechnology innovations in the observed countries. In this regard, we could not accept statistics and other quantitative indicators of the development of nanotechnology which are published by the government or national nanotechnology institutions and organizations of particular countries as comparable indicators



for the needs of comparative analysis. At this moment, the comparative analysis depends on the research findings on the countries' ranking in nanotechnology by independent research global institutions. The competitive status of countries in nanotechnology in 2009 presents their position in the defined competitive groups, and as such it opens up the possibility of further research, forecast or comparative analysis of the positioning of countries in nanotechnology in the future.

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## INVESTIGATION OF ORGANIZING OTHERS TO SELL HUMAN ORGANS: FROM THE SCOPE OF COLLECTING CRIMINAL EVIDENCE

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**Abstract:** Amendment VIII to the Criminal Law of the People's Republic of China has newly created an offence named *organizing others to sell human organs*, which will put forward new requirements for the investigation. On the basis of analyzing the actus reus and mens rea of this offence in criminal law, this article firstly expounds the proof requirement for it and regards 'the act of organizing' as the key element of the constitution of this crime. Meanwhile, the article emphasizes the importance of evidence collection, analyzes the present situation and characteristics of this crime, and suggests verbal evidence collection as a key investigation strategy.

**Keywords:** organizing others to sell human organs, organ trafficking, investigation, evidence collection.

### ELEMENTS OF ORGANIZING OTHERS TO SELL HUMAN ORGANS

In recent years, there have been many illegal trades of human organs in Beijing, Guangdong Hubei and Shaanxi. This is because a shortage of organs in china, a lot of patients with serious illnesses need organ transplant operations, but only few of them get organ. Although 10.000-11.000 organ transplant operations have been done per year in china, it is the second-largest number in the world, still hundred of thousands of people waiting for it. In order to alive, some patients turn to organizers who organize illegal trades of human organs instead of enduring long waiting lists for transplants.<sup>1</sup>The behaviors of organizing others to sell human organs in China nowadays, which not only bring about irreparable misery to the victims, and more seriously, but also cause a bad influence on the whole society. But the organizer could not be trialed with a appropriate charge, because the criminal law of china did not have clear regulation to illegal trades of human organs and relevant charges in the past. One article is added in the Amendment (VIII) to the Criminal Law of the People's Republic of China: "Whoever organizes others to sell human organs shall be sentenced to imprisonment of not more than 5 years and a fine; or if the circumstances are serious, be sentenced to imprisonment of not less than 5 years and a fine or forfeiture of property". This article makes clear the legal responsibility of the organizer who organizes others to sell human organs. Criminal police need to know this article and how to understand it. Therefore, we should first analyze the means and features of the new charge.

#### Subject and complicity

The subject of this crime is a common subject, and the unit can not commit this crime. According to the criminal law, the subject of this crime is natural person who have reached the age of 16. This crime do not punish corporation, because the criminal law state that one kind of crime would not be committed by corporations otherwise provided by law. In the event of the criminal law provided that only organizers should be punished, the seller and the buyer should not be punished in the human organ trade.

This crime belongs to the unnecessary joint offence according to the law, but there are still some exceptions in the legal practice, which is also a random joint offence under some situation.

#### Mens rea

This crime cannot be considered as negligence. The sin of this crime is intent; intentional content is to organize others to sell human organs. "Organization" means the actor should be fully aware of the character of the behavior is to organize illegal human organ trade.

<sup>1</sup> Millions of People Wait for Organ Every Year. retrieved 12 june,2012,from <http://focus.news.163.com/12/0612/12/83Q5B9ES00011SM9.html>

### Actus reus

The action of organizing is the core of committing the crime. Some people suggest that the meaning of 'organization' should be further cleared by judicial interpretation.<sup>2</sup> That is, it should be definite for this offence that whether the number of organizers and number of times be required. But some people argue it is not necessary to discuss, because we can solve it by theoretical analysis.<sup>3</sup> The latter opinion is the stronger one. According to amendment VIII to criminal law, this crime is one kind of intentional injury. The legal interest of intentional injury is the physical right of human body, including the health right and personal body should be inviolable. Because it will violate human rights even one people organizes one time of human organ trade, so the number of organizer and victim should not be the element of this crime. Organizing others to sell human organs, including seeking for donors, contacting with receptors, arranging organ transplant surgery and so on. The offenders who even only have one kind of organizing behavior would constitute this crime. This is because their behavior is also a violation of bodily right. In Chinese criminal law, the crime of trafficking of women is existence on this situation. The people who have acts of abducting, kidnapping, buying, transportation, transit, and such acts of trafficking women would constitute this crime.<sup>4</sup> This is helpful for crackdown on the crime.

Donors who sell their human organ and receptors who buy illegal human organ shall not be punished by law. Still, human organ trade is core of this crime. Human organ trade is the sales transaction which its subject matter is the human organ. There must be a deal to sell human organ and the offender must be an organizer in this deal. The organizer's motivation and purpose are not constitutions of this crime. But the deal to sell human organ must be a voluntary trade. Donors who offer their organ should clearly know the nature of their act is selling organ for money. Donors should recognize physical harm by this deal losing their organ. If not, the organizers should be convicted of intentional assault instead of the offence of organizing others to sell human organs.

### THE CHARACTERISTICS OF THIS CRIME

China's Ministry of Public Security launched a campaign against illegal trades of human organs, in August 2012. This campaign had been taken by a broad range of China's 18 provinces include Beijing, Hubei, Anhui, Shandong, henna, Shaanxi, wiped out 28 illegal trades of human organs gangs, arrested 137 suspects, rescued 127 living organ donors, destroyed 13 illegal organ transplant dens. On the basis of these cases analysis, the characteristics of this crime are as followed:

Firstly, the behavioral features of this crime. It is a complex multi-link behavior. In practice, the criminal behavior of organizing others selling human organs is composed of multiple links, including seeking for donors, providing accommodation for donors, contacting receptors or receptor's family members, arranging physical examination for donors, forging identity card and notarization, contacting physicians to arrange for donors to have an operation, etc. The criminal behavior of organizing others selling human organs consist of three behaviors: (1) the behavior of organizing donors, (2) the behavior of brokering, (3) the behavior of conducting transplants. On the concrete forms, behavior of organizing donors mainly show in organizing donors in charge of seeking for donors on the internet, providing accommodation for donors, taking medical examinations to the donors, placing the message on the internet, sending the donor for transplantation operation. the behavior of brokering show in finding patients who need human organs, placing the message on the internet, and contacting organizer of donors. The behavior of conducting transplants has three ways: (1) providing false documents lead hospital to believe that the donor is a close relative of the patient (2) or providing false documents lead hospital to believe that the human organ which illegal removed is come from a legal organ donor (3) doing illegal organ transplants operation.

Secondly, personal characters of the suspects in this crime. It is a kind of crime which many people involved. Some practical studies show that there are always more than one suspect com-

<sup>2</sup> Li, Na. Hard to Get Evidence in Organ Case, *Legal Daily* (2011), 11 October page 5.

<sup>3</sup> Zhang, mingkai. Basic Issues on Organizing Others to Sell Human Organs. *JinLin University Journal Social Science Edition*, 2011 (5):87-88.

<sup>4</sup> Zhang, mingkai. *Criminal Law*, law press (2003): 706.

mitting the crime of organizing others selling human organs. Sometimes the suspects join together to form a cross-region criminal group. For example, there are 9 suspects in a case which organizing donors in Zhejiang provinces 2012. For another example, a case in Hunan, a criminal gang which doing illegal organ transplants operation, 9 suspects were arrested in 2012. Furthermore, since the variety of the criminal behavior and the wide region involves, there are a lot of kinds of people in these cases, such as donor brokers who only organizing the donors, receptor brokers who only finding receptors and arranging transplants operation. Donor brokers may be jobless, bankrupts, wage earners, drivers, etc. And some of brokers even were victims of illegal organ trade. For example, Liuyu sold Sixty percent of his liver in 2008, who is the principal criminal in a case of organ trafficking in Beijing 2010, and after that he became a donor broker. Most receptor brokers are associated with hospitals. They may be private hospital managers, doctors, nurses, patients and their relatives.

Thirdly, the communication method mainly based on the internet. The internet provides the illegal traders of human organs with a communication platform. The illegal traders of human organs in different area entice the “donors” through the Internet; on the other hand, they publish the trafficking information and take the instant trafficking negotiations in the Internet. If you search for “kidney selling”, there will be hundreds of thousands of links to information about the “donors” and “receptor”. According to the research, the human organ trafficking information are mainly published and spread from internet.<sup>5</sup> It is true that there is an online underground trafficking networks spread all over China.

## DIFFICULTIES IN EVIDENCE COLLECTION

### Less figure and more “dark figure”

Because organ trafficking is absolutely illegal in China, so most of these behaviors are done in secret except placing the message on the internet. Therefore, the fact of organ trafficking is seldom known to outside world. The donors, the receptors, the brokers, they are all keep secret to protect their own interests, and no one willing to go to the police initiatively even. Only in the case of infighting between donors and brokers, or between receptors and brokers, someone of them will reports to police. For example, the Liu-yu case which mentioned above was revealed by a donor. He went to ask Liuyu for the rest of the money, Liuyu promised to give the money to him after surgery, but he was beaten by Liuyu. Organ trafficking cases in the current were mostly discovered because of economic dispute between donors and brokers. This crime is difficult to discover by police because there is no reporter. Even if the police find some clues to investigate, the individuals involved also will keep tight-lipped to protect themselves. Therefore, most of organ trafficking are unknown to the police. We have reasons to believe that, even for people were arrested by police, we do not know all his crimes, because some crimes can not be know at all.

### Difficult to destroy completely

Most of these cases are discovered because of economic dispute between donors and brokers, so the suspects had been taken are almost donor brokers. But the donor broker only is one link in organ trafficking, and the missing link is easily supplied by other people, because the entry barrier is low. The work of donor broker is so easy that a lot of donors become a broker after they sold their organ. For this reason, if we want to disrupt and dismantle the organ trafficking group, we must find the upstream receptor broker. But receptor brokers are very cunning, and are very good at hiding themselves. They connect with donor broker in internet under a pseudonym; when they meet, they only take cash transactions. Using these methods, they hide their true identity. So we hardly get useful information about receptor brokers, even we had taken some donor brokers. As for the donors and receptors, they know little about receptor brokers. Because they were blindfolded in the transaction process, they even did not know where they are. Some receptor brokers work like the drug traffickers, who never appeared in trade process, work through his agents to bring about their object. So it is difficult to find and take them.

<sup>5</sup> Yue,Hongge. New Offence to Fight against Organ Trafficking. Legal Daily (2010), 22 May page 4.

### **Hard to be proved**

It is hard to prove illegal organ trade. Besides the transplantations, all the criminal behaviors happened on the internet. So if there is no surgery, we hardly prove guilty only by information online. Because a conclusion, which only stands on online information without true identity, is can not beyond a reasonable doubt.

It is difficult to collect the witness' testimony. The donors and receptors are most important witnesses in these cases, but it's very hard to get testimony from them. To the receptors and their family, they are witnesses of the illegal trade, but they also beneficiaries of organ trafficking. They fear to get themselves into trouble, so they do all can do to hide their personal information from investigation. Therefore it is difficulty to find them out. Even if the police find the receptors, they are also not willing to be a witness. To the donors, they are victims in organ trafficking, and they are also the most important witness in these cases. But unfortunately they are also the most uncooperative witnesses. Selling their organ is one of the most despicable acts in china, because In China traditional ideas the body is a precious gift which given by parents. If this matter becomes known, it will ruin your reputation. For example a young man sold one of kidney for betrothal gifts, but when his fiancée knew the truth, she cancelled the engagement instead of moving. Therefore they will try their best to hide their true identity in the process, and they also will not to admit the truth. Besides most of the donors are living in poverty, they have no work and no permanent residence. So some times it is difficult to find them to get testimony yet.

### **NECESSARY EVIDENCE TO CONVICT THIS CRIME**

According to analysis on the elements of organizing others to sell human organs crime, we should collect evidence in the following sections, set up a reliable chain of evidence, which would contribute to identify the crime as well as benefit to the whole process of criminal justice procedure.

#### **Proof of subject and complicity**

Two aspects should be noticed when proving the subject of the crime: one is criminal capacity. Criminal capacity is a concept in the sense of Chinese criminal law. It means the capability of criminal responsibility. Only people who have full capacity can be the suspects of this crime. Therefore we should collect evidence to prove that suspects are over the age of criminal responsibility. Furthermore, It is need to collect evidence to prove that suspects have no mental disease, when defenders take insanity as a defense in the cases.

The second one is corporation crime. Sometimes the organizer of organ trafficking is a company. But this crime do not punish corporation, so it requires collecting evidence to accuse the person directly responsible in investigating. There are two kinds of corporations in the cases: company established for illegal purposes and common company does things against the law. In the first case, it is an illegal company; we should prove its illegal purposes and the founders are joint crime. In common company case, we should find out the main person-in-charge and the person directly responsible to joint offense.

#### **Proof of mens rea**

The criminal intent of the crimes of organ trafficking is the direct intent. The direct intent shall consist of cognition factor and will factor. The cognition refers to the knowing of actor to the nature of their behavior. Mostly we can prove the cognition by proving the act of organizing. But sometimes the suspects argue that they did not know the nature of their behavior. For example, they may argue that they thought their behavior is to recruit worker for their boss instead of gathering people to sell organ. To reject their defense like this, we should collect evidence to prove the suspects exactly know what they did. Detective can take targeted investigation to reject their argument. According to the targeted investigation, documentary evidence, material evidence, statements of victims, witness testimony, statements and exculpations of criminal suspects, can be used as proof of cognition factor to prove suspects have the sin of direct intent.

The will factor of suspects with direct intent means that they pursue harmful consequence with illegal act. The harmful consequence means completion of human organ transaction in this crime. And the pursuit of harmful consequence means the suspects intentionally do thing to facilitate organ transactions. Strong will of actor to pursue harmful consequence is the performance of the will factor. The strong will of actor to pursue harmful consequence may be manifested by fully preparing and careful planning before hand, overcoming difficulties and resistance in the course of the crime. So we can prove strong will of suspects by investigating the detail of organization behavior, for example the action of motivated seeking for donors, forging identity card and notarization, etc.

### **Proof of actus reus**

We could find out the case and collect criminal evidence along the organ trafficking chain. The organ trafficking chain can be divided into three phases in turn: the firstly, the organizers contact with the donors and they get agreement on organ trafficking. The second, the organizers make arrangement for organ transaction. The third, arrange operation on donors. The organ transplant surgery is the end of the organ transaction. When the surgery has been gone, the organization of organ trafficking is over. The former two phases are necessary to convict, and the last one is for sentence.

## **HOW TO COLLECT EVIDENCE**

Evidence collection on subject and complicity

Detective should collect evidence of suspect's identity, age and mental normality; make sure he has the capability of criminal responsibility. In practice, the organizers often join together to form a criminal group, sometimes even a criminal syndicate which have complex organization structure. So we also need to collect evidence about the criminal group, as to the relationship between individuals in the group, and the division of labor between members of the organization. The criminal group is stronger than individual in anti-detection capabilities and vitality. It is an effective means to investigate the organized crimes, gangs and other criminal cases by undercover investigation. Therefore sending an undercover agent to criminal group may be the most effective method in the evidence collection.

### **Evidence collection on mens rea**

The focus here is to demonstrate that the actor knows perfectly well the nature of his behavior. Different proving strategies should be applied to different subjects. As for those people directly organizing the organ trafficking, the key here is to prove they know clearly well the nature of his behavior. Detective should prove that the suspect have cognitive conditions to know clearly well the nature of his trafficking organ behavior by investigating the actor's natural condition and social background, the people around them, and the persons in the know. As for the ringleader of illegal human organs business with indirect organizational behavior, the main point is to prove heir subordinating relationship and they know the illegal act of their understrapper. Subordinating relationship between the direct actor and the ringleader can be proved by investigating the economic relationship between them. Communicating record between them can help to prove heir subordinating relationship yet.

### **Evidence collection on actus reus**

All the collected evidence must face the effectiveness evaluation under the people's court. So the form and source of the evidence should abide by the law. New legislation of criminal procedure law provides new forms of evidence, electronic evidence. It is helpful to detect this crime which conveying information on internet. New legislation provides the technical investigation is legally measure of investigation. In order to prove details of organ trading, several type of legal evidences should be collected, such as documentary evidence, physical evidence etc.

Because it is hard to find material evidence, so detective should pay more attention to col-



lect verbal evidences to prove this crime. The verbal evidence can be collected from donors, receptors and insiders. The donors are the victim in these cases. They are participants of organ trafficking, so recording their oral testimony will have a great help to trial. Receptors are participants of organ trafficking, too. But it is not easy to record their oral testimony. Because they are the beneficiaries in this crime, so they may not cooperate with the police at the first. Before the interview detective should find the receptors firstly. Then persuade the receptors provide testimony to the police.

The organizers of organ trafficking are semi-overt, for they are career criminals and organize in fixed hospital or someplace. So doctors, nurses, hospital officials, cleaning staff and small traders around hospital, they are all the potential witnesses. They can be divided into two groups: beneficiaries and spectators. The investigation to the beneficiaries is difficult. Because the organizers may be pay them to smooth the organ transplant surgery. So the beneficiaries could commit the bribery crime or else. They will not provide testimony to protect themselves. The tainted witnesses do not have immunity in china, so if we want get testimony we should prove them guilt firstly. The point is how to find out on the latter. Through massive visits the investigation by detective to find spectators, and record their testimony. At last when we get all the verbal evidences from these witnesses, we can get an unbroken chain to prove organization of suspects.

## **HOW TO INVESTIGATE AND COLLECT EVIDENCE**

### **Take initiative to discover cases**

The police investigation at present is passivity in most cases, and no investigation without report. There is seldom positive reporter in these crimes, because they all do it by their own free will. For this reason, organ trafficking have a low rate of report, and many criminal are still at large without prosecution. We can not start to investigation before crime discovery, so we must do more work to discover crime proactively, and even to prevent the crime from happening:

Search internet for sensitive information to discover organ trafficking.

Monitor all the hospitals, which are authorized by the Ministry of Health to perform organ transplants, to obtain exception information.

Monitor the manufacture and sales of medical device which are needed for transplantations.

### **Solve cases timely**

Criminal police must pay attention to each of report and investigate it timely. Without prompt action, the suspects may avoid arrest. If we take timely action, we can not only find the suspects timely, but also can bust a crime ring organizing organ trafficking. The victims and their relatives had been severely hurt in these cases, and they can get a comfort from case cracked yet. This could prevents victims and their relatives from more psychological harm which may let them overreacted.

According to characteristics of this crime, donor brokers are usually arrested first. After that the police should continue their success with further investigation. The police should take further investigation to know whether the donor broker still have remaining crime undiscovered, and who are behind these trade.

### **Different behavior different evidence**

Organ trafficking is almost an open secret in some big city, telephone poles are plastered with advertisements about organ trade, brokers often can be found in hospital. Therefore it is not hard to find clues to organ trafficking. But as indicated earlier, it is hard to find evidence to prove guilty. As mentioned above, there are three kinds of behaviors in organ trafficking, and to each kind of behavior different ways should be taken when police collect evidence. For example, we could post undercover agents to collect evidence and track down the crime. For another example, the enticement investigation, or police trap, is also an effectual mean of collecting the evidence and making arrests.



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## CRIMINALISTIC REGULATIONS, PRINCIPLES AND FUNDAMENTALS

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**Abstract:** The author tries to characterize importance and consequences of using and not using regulations, fundamentals and principles in criminalistic activities. He considers existence and realization of methods in particular fields of research as the primary prerequisite of successful criminalistic activities. The methods can be realized only according to relevant scientific rules and patterns. Theory of criminalistics introduces relevant fundamentals, regulation or principle as an application rule in order to be able to successfully realize methods with assistance of concrete procedures of particular fields of criminalistic research. The study is an attempt to present the partial results of research: Centrum excelentnosti bezpečnostného výskumu kód ITMS: 26240120034 supported by the Research & Development Operational Programme funded by the ERDF.

**Keywords:** criminalistics, activity, regulation, rule, rule of behaviour, method, procedure, instruction.

Criminalistics, as well as other practical sciences<sup>1</sup>, can be divided into theoretical and practical criminalistics from the point of application. There are other important criteria for dividing criminalistics, too. Division according to system or taxonomy of criminalistics into criminalistic technical and criminalistic tactical methods<sup>2</sup> was historically favoured and accepted for quite long time. In this classical historical division according to the taxonomy theory of criminalistics, which is often referred to as a general part of criminalistics, has its own methods of observations (general methods of observation). Methodology of criminalistics, which does not have its own methods and if taken from practical point, it does not need them, is left aside<sup>3</sup>. Another important division is for example according to content and origin of used methods into naturalistic, sociopsychological, technical and humanistic.

Theoretical criminalistics (sometimes we refer to it as a theory of criminalistics) is focusing on conceptual, methodological and system questions of criminalistics and development of particular methods of criminalistics.

Practical criminalistics is or rather in some cases was called as methodology of criminalistics<sup>4</sup>. It focuses on practical application of criminalistic theory, mainly on methods of criminalistics, which are often linked with particular fields of criminalistic research. These applications can be frequently found in the forms of procedures, technologies, concrete applications of methodologies<sup>5</sup> in practical level of criminalistic cognition – research.<sup>6</sup>

### Criminalistic Methods and Their Importance When Determining Application Rules

In general method is a procedure, activities by which we can or must reach predetermined goal.

1 HOLOMEK, J.: *Niektoré východiská teórie a metodológie policajných vied*. In.: *Policajná teória a prax* č. 1, roč. 10 / 2002, s. 5 – 21. ISSN 1335-1370.

2 KRAJNÍK, V., a kol., *Kriminalistika*. 1. vyd. A PZ v Bratislave. Bratislava 2002. ISBN 80-8054-254-6.

3 METEŇKO, J., METEŇKO, M., HEJDA J., *Digital trace*. 7th INTERNATIONAL SYMPOSIUM ON FORENSIC SCIENCES Sep 29th - Oct 1st, 2005, Častá - Slovak republic. KEU PZ PPZ. Bratislava 2005. (s.182) ISBN 80-969363-2-8. EAN 9788096936325. s. 55-79.

4 KUBÍKOVÁ, I., METEŇKO, J., SAMEK, M. Možnosti metód kriminalistiky pri modernizácii trestného poriadku SR. In *Reflexia zmien právneho poriadku vo vyučovacom procese na Akadémii Policajného zboru*. Zborník príspevkov z teoreticko-praktického seminára dňa 28. marca 2006. Ed. Ľuboš Wäldl. Bratislava: Akadémia PZ, 2006, s. 92-98. ISBN 80-8054-377-1.

5 In the past there were nearly all applications of criminalistic theory named in the same way. For example see: BANGO, D., VIKTORYOVÁ, J., *Metodika vyšetrovania vybraných druhov trestných činov proti majetku*. Bratislava: Akadémia PZ - K vyšetrovania, 2000. - 94 s. ISBN 80-8054-156-6

6 FENYVESI, CS., HEJDA, J., METEŇKO, J., *Tendencie a trendy informačnej a komunikačnej kriminality*. In.: *Metenko, J., Kubíková, I., Samek, M., Yearbook 2006. KKFD, EAS, CECC Zborník výsledkov vedecko-výskumnej činnosti Katedry kriminalistiky a forenzných disciplín a medzinárodnej spolupráce*. Bratislava 2006, Akadémia PZ v Bratislave, 8 MB, ISBN 80-8054-382-8 EAN 9788080543822, 243 s., CD

This simplification is used for better understanding and in the case of method it is conditioned by scientism of the mentioned procedure. It would be better to claim that the method implicates several parallels or in sequence arranged scientifically reasoned procedures. Another aspect of the method, as a scientific procedure in the cognition process, is the fact that in the same conditions and when the procedures are known beforehand the result is always the same.

Criminalistic methodology has been minimally elaborated at present as well and so the methods in criminalistics had and have vague content and lifetime too. Some criminalists, practitioners and theoreticians call criminalistic method the field of criminalistic research (for example dactyloscopy). Some refer to methods in separate fields/disciplines of criminalistic research (for example they refer to method of detection of dactyloscopic trace with the help of oblique illumination). Whereas some refer to it only as a procedure when using method of dactyloscopic identification or method of optical detection of latent dactyloscopic traces.

In spite of this unclearness criminalistics generally recognizes that there are some certain criteria applied for criminalistic methods. They are crucial if a certain scientific procedure or combination of scientifically accepted procedures are to be inserted or not inserted into the category of criminalistic methods<sup>7</sup>. Following criteria are considered<sup>8</sup>:

- accord with valid legal rule,
- each method is scientifically based,
- each method is checked by criminalistic practice,
- each method is acknowledged by criminalistic practice.

Criminalistic methods have relatively stable character, but procedures of their application are quite variable. Criminalistics, in relation to methods, creates own methodological system.<sup>9</sup>

Referring to our theoretical introduction we can state that in the process of criminalistic research, hence in criminalistic cognition there are used<sup>10</sup>:

- (a) general methods,
- (b) methods taken from other scientific disciplines,
- (c) specific criminalistic methods.

## GENERAL METHODS ARE USED EITHER IN ALL OR SEVERAL FIELDS OF COGNITION

**Observation** is intentional, planned, purposeful perception with the aim of researching into phenomena or subjects. In criminalistic practice it is essential and the most frequently used empirical method of observation. So we can say that who is not able to observe well cannot be a good criminalist.

A practical display of the method of observation in criminalistics can be for example its application in the search of premises. However, the majority of criminalists consider the search of premises as one of the criminalistic method (criminalistic tactical method). Tactics of crime scene processing is a procedure providing an optimal application of all methods and means for searching, examining, evaluating, seizing/preserving all important objects in particular traces. A success criterion of the method lies within the information utility of the examined objects and relationships between them serving as the evidence for criminal proceedings. Observation is a fundamental cognitive method of searching the premises; it means the observation that is direct, observation applying all human senses as well as special technical equipment when

<sup>7</sup> SAMEK, M., METENKO, J., BAČÍKOVÁ, I., Kriminologické odporúčania realizácie domovej prehliadky v procese vyhľadávania a zaisťovania ziskov a iných materiálnych výhod z trestnej činnosti. In *Zisťovanie a konfiškácia majetku pochádzajúceho z trestnej činnosti*. Zborník príspevkov z medzinárodného seminára dňa 9. decembra 2006. Ed. Jozef Stieranka. Bratislava: Akadémia PZ, 2006, s. 65-72. ISBN 80-8054-395-X, EAN 9788080543952.

<sup>8</sup> METENKO, J. A KOL.: *Kriminologické metódy a možnosti kontroly sofistikovanej kriminality*. 1. vyd. Katedra kriminalistiky a forenzných disciplín, Akadémia PZ v Bratislave. Bratislava 2004. ISBN: 80-8054-336-4, EAN: 9788080543365. s. 356.

<sup>9</sup> PORADA, V., a kol., *Kriminalistika*. 1. vyd. CERM. Brno 2001. ISBN 80-7204-194-0.

<sup>10</sup> TREMMEL, F., FENYVESI, C., HERKE, C. *Kriminalisztika Tankönyv és Atlasz*. Dialóg Campus Kiadó, Budapest-Pécs, 2005., or ALAMOREANU, S. *Elemente de Criminalistica*. Alma Mater, Cluj-Napoca, 2000. , or HEJDA, J., KRAJNÍK, V., KŘEPELKA, J., METENKO, J., PORADA, V., ŠTRAUS, J., *Výbraná témata kriminalistiky a trestního práva*. 1. vyd. - Praha: Vysoká škola ekonomická, 2007; Praha: Oeconomica, 2007, 251 s., ISBN 978-80-245-1163-4

required. This observation enables to get acquainted thoroughly with all elements of the event being examined or the objects being searched; ideally in combination with other methods (e.g. comparison, modelling, analysis, synthesis and so on). Observation thus leads to an in-depth cognition and a correct interpretation of ascertained facts<sup>11</sup>.

Other general methods are:

**Comparison** is a concurrent examining and evaluating of objects aiming to find their consentaneous and distinct characteristics.

**Measuring** represents a type of comparison with the aim of qualitative determining the selected characteristics and the relationships between objects and phenomena. It is possible to measure only those characteristics that are of quantitative nature, i.e. those ones that are precisely defined and selected beforehand acquiring different format.

**Description** expresses characteristic features of the examined objects. It represents the way that captures the state of objective reality in order to preserve information for further use. Sensually perceived image of objects or events is altered by means of describing into the verbal or other informative signal that is in principle recorded onto the solid information carrier. We recognize two types of description: **systematic description** abided by rules set beforehand; **unrestricted description** that is not set beforehand generally occurring in natural speech.

**Experiment** represents the method of examining phenomena of objective reality and their coherence in the context of conditions controlled and altered on purpose by its user, whereas the person experimenting interacts actively into the objective reality keeping constant control over the occurring processes and their conditions. It includes in its self sensory as well as logical part of the cognition. In criminalistics practice the experiment occurs in two forms:

1. as a separate criminalistic method,
2. it can constitute a part of another more complex criminalistic method.

**Modelling** examines real objects by means of other in principle artificially created objects in which only selected characteristics, features and relationships of the original object are expressed and defined.

## METHODS ADOPTED FROM OTHER SCIENTIFIC BRANCHES

In the field of criminalistics these methods are widely utilized. They are called **specific criminalistic methods** as they represent concrete application of general knowledge from the parental scientific discipline to criminalistics. They constitute the most dynamic group of methods mainly due to the immense progress within the knowledge of humankind relating almost to all areas of human activities. Among the most frequently applied methods are the methods used in physics, anthropology, biology, chemistry, medicine, psychology, sociology and logic. Physical, physicochemical and chemical methods are applied in examining nearly all material objects and traces. Chemical methods are predominantly used in examining the traces of substances. We speak of microscopic and photographic methods, chromatography, gamagraphy, neutron activation analysis and so on. Physical methods prevail in examining field traces. Nowadays these methods are irreplaceable in criminalistics as examining of relevant objects has been shifted into the area of micro-traces and nano-traces. Biological and anthropological methods are traditionally widely utilized. They serve for the identification of living as well as dead persons, animals, insects and plants, i.e. for examining all biological objects that qualify to be criminalistically relevant traces. Forensic anthropology is applied in describing persons, forensic information technology, in search and the identification of skeletonized remains. Methods of molecular biology and genetics have been utilized widely. Within the process of decoding the information from the memory trace as well as in further practice of criminalistics it is the psychological methods, methods of management, information technology, logics, sociology that have their irreplaceable position<sup>12</sup>.

<sup>11</sup> MUSIL, J., et al. *Úvod do kriminalistiky*, PACR Praha 1984, s. 184. 215 s.

<sup>12</sup> ŠIMOVČEK, I., et al. *Kriminalistika*, Akademia PZ v Bratislave, 1998, s. 16.

## SPECIFIC CRIMINALISTIC METHODS

Specific criminalistic methods originated in the field of criminalistics and are designed for its particular needs. According to some criminalists these methods not only originated in the field of criminalistics but will also terminate there as well. The above mentioned methods are numerous and are widely applied. They originated within the process of development of criminalistics, more precisely as an answer to its real requirements and needs. At the same time these methods are the driving force of criminalistics owing to which criminalistics has been constituted a self-dependent science. Some of the above mentioned methods are applied only to solving partial tasks. Other methods are of more complex nature as they are related to the whole process of examining criminalistic cases. Classification of all criminalistic methods is closely related to the classification of criminalistics - more precisely with systematics being applied. Specific criminalistic methods are differentiated by the prevailing character of their procedure, applied means and partial operations. These methods might be of more technical or structurally technical nature. Thus one can speak of technical or tactical criminalistic methods regarding the prevailing character of the procedure, operations and means, their utility in solving problems in the field of criminalistic detection. This constitutes one of the possible criteria for their division.

Following is connected with the generic division of examined subjects, especially traces, into the methods exploring substantive traces, methods exploring memory traces, methods exploring micro-traces, methods exploring traces of fields<sup>13</sup> and methods for exploring and detention of all traces which are significant from the viewpoint of criminalistics.

Particular application of all methods is always connected with a suitable and criminalistically advised procedure<sup>14</sup>. There can be more applied procedures, with each of the methods being advised several. Under the term of criminalistic procedure we understand a criminalistically defined technological process of search, detention, close examination and interpretation of the content of a criminalistic trace or other criminalistically relevant object. Suitable criminalistic principles and fundamentals are implemented for the application of each of the methods. For using a particular criminalistic procedure within individual method it is always necessary then to define rules of its utilization.<sup>15</sup>

As a suitable example of rules, principles and fundamentals implemented with particular criminalistic methods we can use the method of surveillance, most often applied with the criminalistic reconnaissance within the criminalistic practice.

## RULES, PRINCIPLES AND FUNDAMENTALS RELATED TO THE METHOD OF SURVEILLANCE IN CRIMINALISTICS

As an intentional, systematic and meaningful perception of in advance determined objective, surveillance, as a criminalistic method, is applied almost in all criminalistic areas of examining, in many methods and particular procedures. It can be realized in all these areas only according to in advance determined conditions which we call fundamentals or principles – if they are related to particular methods and rules<sup>16</sup> – if they are related to individual ways of applications of these methods.<sup>17</sup>

13 FENYVESI, CS., HEJDA, J., METEŇKO, J., Tendencie a trendy informačnej a komunikačnej kriminality. In.: Meteňko, J., Kubiková, I., Samek, M., *Yearbook 2006. KKFD, EAS, CECC Zborník výsledkov vedecko-výskumnej činnosti Katedry kriminalistiky a forenzných disciplín a medzinárodnej spolupráce*, Bratislava 2006, Akadémia PZ v Bratislave, 8 MB, ISBN 80-8054-382-8 EAN 9788080543822, 243 s., CD, inak ZÁHORA, J., Uchovanie a vydanie počítačových údajov. In *Justičná revue* č. 1/2006, p. 7.

14 LISON, M., METENKO, J. Registrované aktivity kriminálnych skupín na území SR. In: Lupták, Ľ. a kol. *Panorama globálneho bezpečnostného prostredia 2006-2007*, Ministerstvo obrany SR, Bratislava 2007, ISBN 978-80-89-89261-11-6, p. 749-758

15 METEŇKO, J., *Relatia dintre Stiintele Judiciare si Criminalistica in raport de anumite metode*. In.: *Revista de Criminologie, de Criminalista si de Penologie* nr. 3/2006 s. 78-86 7th INTERNATIONAL SYMPOSIUM ON FORENSIC SCIENCES Sep 29th - Oct 1st, 2006, Cluj-Napoca 2006. – Ministerul Public parchetului de pe Langa Inalta Curte de Casatie si Justitie ISSN 1454-5624 274 s.

16 METENKO, J., HEJDA J., Predmet a metody kriminalistiky. In.: *Meteňko, J., Kubiková, I., Pokroky v kriminalistike 2005. Zborník z medzinárodnej konferencie konanej v dňoch 26.-28. 6. 2005*. 1. vyd. Akadémia PZ v Bratislave, Bratislava 2005. ISBN 80-8054-359-3. p. 38-46.

17 HEJDA, J., KRAJNÍK, V., KREPELKA, J., METEŇKO, J., PORADA, V., ŠTRAUS, J.,



**Intentionality** is the feature by means of which surveillance differs from the regular perception. Observer intentionally turns his attention towards a particular object and by means of his senses he tries to contact the object. **Method** means that the observer selects appropriate objective conditions, sets up a certain sequence and time schedule for the observation, obtains appropriate tools (e.g. illumination), etc. **Meaningfulness** means subordination of a particular procedure to final aim of the particular method, **fixation** – that from the huge number of facts which surround us we select only those that are criminalistically relevant. Therefore, surveillance contains sensible, as well as rational part of knowledge. Main methodological requirements upon surveillance are **accuracy, authenticity**, and consequently **objectivity**. In relations to scientologists – observers French biologist Claude Bernard said: “If it is possible, the observer should remain silent and listened to the nature.” Incorrect observers consider facts with the biased idea and they attempt to find confirmation of their theory in the results of the observation.<sup>18</sup> Therefore, “It is more necessary to believe in phenomena rather than our thoughts...”<sup>19</sup> Criminologist should be able to drop his subjective ideas and respect only the facts in the maximal degree. Surveillance should be **systematic and oriented** upon selected relevant features and, if possible, repetitive. **Repetition** lessens probability of mistaken perception by the influence of accidental or subjective circumstances. Unfortunately, it is not always possible in criminalistic practice to repeat the observation as some of the traces fade quickly. Therefore, **the first surveillance** has to be done as carefully as possible. If it is possible, conditions of the observation should be performed **variably**, e.g. by means of selecting different types of illumination, with various zooming, from different viewpoints, etc. Variability of the conditions of surveillance usually enriches the resulting information. In the course of the entire observation, especially in its end however, there should be its **assessment**. That is searching the connection among partial phenomena, identification of ongoing changes, determining relations towards other objects. On the other hand, unification can be possible only with those things which are joint inside – in our case it is the singular criminalistic theory. However, observation does not serve only for the purpose of recognition of outside features of the examined object or phenomenon. By means of **analysis** of examined features/characteristics it is possible to come to recognition also of those features which are **hidden** from the immediate surveillance, under the cover of the phenomenon or in **its substance**. That means to come to detection of its legitimate features, **connections and tendencies** of its development.

Objects of the observation within the criminalistics are most frequently criminalistic traces, their manifestations or related objects. In reality they are various things and natural actions, but also people and their conduct. *Observation is the content filling of all criminalistic methods. This method is characteristic for reconnaissance of a place and majority of searched objects*, however, it is an inseparable part also of the interrogation, criminalistic experiment, dactyloscopic or trasologic research and other methods, or areas of criminalistic research.

## CONCLUSION

The result of whichever failure in one of the fundamentals or principles of the method of surveillance, eventually their combined infringement, is an inaccurate, incomplete, delayed or disabled objective knowledge of the content of a criminal trace. Consequences are always of the criminalistic nature – already mentioned failure in accomplishing the goal, but also penal, social, ethical, economical, military or of other nature – always connected with a particular aim of the criminalistic recognition. Breaching the rules of application of the procedure with a particular method leads primarily to the breach of objectivity of criminalistic recognition, as well as to the loss of effectiveness of the given method. It does not always have to lead to the entire loss of possibility of recognition, if the given method contains variant possibilities of procedures or if it is possible to repeat the given procedure within different conditions. Indeed, the threat of breaching penal-processing principles remains, even when other threats are not justified. The study is an attempt to present the partial results of research: Centrum excelentnosti

*Vybraná témata kriminalistiky a trestního práva*. 1. vyd. - Praha: Vysoká škola ekonomická, 2007; Praha: Oeconomica, 2007, 251 s., ISBN 978-80-245-1163-4

18 VALERIAN, L., Ohledání - kriminalistická metoda provedená ve specifických podmínkách. - In: *Pokroky v kriminalistice*. Sborník příspěvků z mezinárodní konference. - Praha: Policejní akademie České republiky, 2006. - S. 352-364

19 MUSIL, J., et al. Úvod do kriminalistiky, PACR Praha 1984, s. 184. 215 s.



bezpečnostného výskumu kód ITMS: 26240120034 supported by the Research & Development Operational Programme funded by the ERDF.

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## THE CRIMINALISTIC PROVIDING OF EFFECTIVE CYBERCRIME COUNTERACTION

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**Abstract:** In this presentation there is an analysis of the problem of low efficiency of the fight against cybercrime in Russia and abroad. I will show the basic directions of overcoming this situation. There is a task stands before criminalistic: the development of adequate methods of research of digital information and computer facilities together with the investigation of cyber-attacks. The use of special knowledge comes to the fore in detecting and investigating and should be considered at research of criminalistic programs of organization of detection and initial stage of the investigation, when the criminal qualification of the committed crime is not clear yet. No less important is the establishment of permanent effective forms of interaction between law enforcement agencies of different countries, authorized to investigate cybercrime. Interaction in real time, without the written requests of legal aid must become an instrument of immediate response on international cyber-attacks and that becomes a guarantee of collection of digital evidence in full. To achieve this aim it is necessary to implement one more important direction of harmonization of national and international criminal law on counteraction cybercrime.

**Keywords:** Cybercrime; research of digital information and computer facilities; the technique of investigation of cybercrime; international cooperation in counteraction computer crime; harmonization and unification of national and international criminal legislation against cybercrime.

## КРИМИНАЛИСТИЧЕСКОЕ ОБЕСПЕЧЕНИЕ ЭФФЕКТИВНОГО ПРОТИВОДЕЙСТВИЯ КИБЕРПРЕСТУПНОСТИ

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В докладе анализируются проблемы низкой эффективности борьбы с киберпреступлениями в России и за рубежом. Предлагаются основные направления преодоления ситуации. Перед наукой криминалистикой стоят задачи по разработке адекватных методик исследования цифровой информации и компьютерных средств связи с расследованием кибератак. Использование специальных знаний выходит на первый план при выявлении и расследовании и должно учитываться при разработке криминалистических программ организации выявления и начального этапа расследования, когда уголовно-правовая квалификация совершенного преступления еще не ясна. Не менее важным направлением является установление постоянных эффективных форм взаимодействия между правоохранительными органами разных стран, уполномоченными расследовать киберпреступления. Взаимодействие в режиме реального времени, минуя письменные запросы о правовой помощи, должно стать инструментом моментального реагирования на международные кибератаки и залогом сбора цифровых доказательств в полном объеме. Для достижения этой цели необходима реализация еще одного важного направления - гармонизации национального и международного уголовного законодательства по противодействию киберпреступности.

**Ключевые слова:** киберпреступность, исследование цифровой информации и компьютерного оборудования, методика расследования киберпреступлений, международное сотрудничество в противодействии киберпреступлениям, гармонизация и унификация национального законодательства в сфере противодействия киберпреступности.

## ВВЕДЕНИЕ

Киберпреступность в последнее время становится для человечества угрозой наравне с наркобизнесом и терроризмом. Ее общественная опасность столь велика, что мировое сообщество уже всерьез занято проблемой организации международного противодействия возможным кибервойнам. В мае 2010 года на Первом саммите по кибербезопасности в Далласе (США) было инициировано принятие решения о начале работы над правилами ведения войн в киберпространстве. Международные организации при участии России и США ведут работу над созданием конвенции по ведению кибервойны<sup>1</sup>. Несмотря на высокую латентность, совершение киберпреступлений во всех странах мира влечет причинение огромного материального, морального и политического вреда гражданам, юридическим лицам, обществу и государствам, который усиливается тем обстоятельством, что преступления в сфере высоких информационных технологий являются транснациональными, носящими международный характер, зачастую совершаемыми международными организованными преступными группами. Такое положение заставляет криминалистов всех стран направлять усилия на разработку новых стратегий противодействия киберпреступности с ориентацией на эффективное международное сотрудничество и взаимодействие.

## ОЦЕНКА ЭФФЕКТИВНОСТИ ПРОТИВОДЕЙСТВИЯ КИБЕРПРЕСТУПНОСТИ

Стоит признать, что уровень противодействия киберпреступлениям в России остается низким. Несмотря на то, что ежегодно число выявленных и расследованных преступлений в сфере высоких информационных технологий неуклонно растет, тем не менее, значительное число преступлений остаются нераскрытыми. За девять месяцев 2013 года в суд было направлено свыше 5 тысяч уголовных дел о преступлениях в сфере высоких информационных технологий, что на 12,6 % больше, чем за этот же период 2012 года. Основной вес составляют дела, связанные с распространением детской порнографии в интернете, вредоносных программ, с мошеннической деятельностью в банковской сфере на миллионы рублей<sup>2</sup>. По-прежнему наблюдаются две тенденции: совершение преступлений профессионалами, которые создают мощные вирусные программы, способные парализовать работу целых предприятий и организаций, и «банальными мошенниками», совершающими мошеннические действия с использованием интернета и мобильной связи и похищающими незначительные средства у граждан, которые в сумме, тем не менее, составляют сотни тысяч рублей.

В то же время исследования показывают, что число совершенных преступлений значительно выше официальной статистики. Так, по результатам отчета NortonReport<sup>3</sup>, в 2013 году: 85% россиян сталкивались с киберпреступлениями, 59% пользователей смартфонов сталкивались с мобильными киберпреступлениями; 60% пользователей старше 18 лет используют публичные или незащищенные сети Wi-Fi. Каждая кибератака на сети крупных российских компаний наносит финансовый ущерб организации в среднем на сумму в 695 тыс. долларов. Компании среднего и малого бизнеса теряют около 14 тыс. долларов за один киберинцидент. Такие выводы сделаны в совместном исследовании компании B2B International и «Лаборатории Касперского»<sup>4</sup>. Ущерб, наносимый компаниям, устанавливался исследователями B2B International путем опроса ИТ-специалистов из 24 стран мира, включая Россию. Всего при подготовке отчета было опрошено 2895 респондентов. По мнению составителей исследования, к финансовым потерям ведут три главных следствия кибератак: вынужденный простой компании, упущенные возможности для ее бизнеса (в том числе потери контрактов) и дополнительные расходы на услуги специалистов для ликвидации последствий кибератак. Исходя из затрат этих факторов рассчитывалась средняя сумма ущерба. Самым дорогостоящим фактором по данным отчета признан вы-

1 <http://mydiv.net/arts/view-kiber-war.html>

2 <http://www.tadwiser.ru/a/87064>

3 <http://www.symantec.com/norton-report-2013>

4 <http://www.tadwiser.ru/a/53662>

нужденный простой компаний. Эти данные, собранные в российских компаниях, отличаются от глобальных данных из того же отчета: в среднем по миру дополнительные расходы средних и малых компаний после кибератак составляли в среднем 13 тыс. долларов, а крупных предприятий - 109 тыс. долларов.

### **ПРИЧИНЫ НИЗКОГО УРОВНЯ БОРЬБЫ С КИБЕРПРЕСТУПЛЕНИЯМИ**

Низкий уровень борьбы с киберпреступлениями объясняется объективными и субъективными причинами. Среди объективных причин главной является сама природа указанных преступлений, которые совершаются в особой среде, обуславливающей специфический механизм совершения преступления и своеобразное слепообразование, вызываемое особенностями цифровой информации, обрабатываемой с помощью компьютерного оборудования и передаваемой посредством информационно-телекоммуникационных сетей. В связи с этим особую актуальность в процессе выявления и расследования приобретает использование специальных знаний. Они требуются на всех этапах расследования, поскольку криминалистическая характеристика рассматриваемой группы преступлений обуславливается фактором постоянного поступательного движения в развитии информационных технологий, коммуникационных систем, компьютерных средств и электронного оборудования. Одним из способов использования специальных знаний в уголовном процессе является привлечение специалиста к производству следственных действий для оказания помощи следователю при обнаружении, изъятии, фиксации следов преступления. Несмотря на рекомендации, разработанные криминалистами, следователи зачастую осуществляли изъятие компьютерной информации без участия специалиста, изымали электронные носители с информацией, не имеющей отношения к предмету доказывания. Продолжительные сроки расследования, длительное производство судебных компьютерно-технических экспертиз (иногда более 2 месяцев) влекли за собой негативные последствия для владельцев изъятых носителей компьютерной информации. В частности, изъятие компьютерного оборудования у юридических лиц на неопределенный период значительно затрудняло или даже приостанавливало их деятельность, причиняя неоправданный ущерб. Факт изъятия компьютерной информации без участия специалиста использовался защитой для оспаривания полученных доказательств. Основывая свою позицию относительно признания доказательств недопустимыми, сторона защиты нередко ссылалась на то, что в ходе изъятия носителей компьютерной информации в нее были внесены изменения и таким образом сфальсифицированы доказательства. Обобщение судебной следственной практики показало, что суды в ряде случаев соглашались с аргументами защиты и признавали значимые для дела доказательства недопустимыми. Федеральным законом от 28 июля 2012 г. № 143-ФЗ «О внесении изменений в Уголовно-процессуальный кодекс Российской Федерации» введено обязательное участие специалиста в изъятии электронных носителей информации при обыске и выемке, а также предусмотрены дополнительные гарантии прав законных владельцев информации. Однако такая мера не позволила решить все проблемы, поскольку, во-первых, изъятие носителей электронной информации осуществляется не только в ходе обыска и выемки, но также при осмотре места происшествия, личном обыске, проверке показаний на месте, во-вторых, законодатель обязал следователя обеспечить участие специалиста во всех случаях изъятия электронных носителей информации, независимо от того, изымаются электронные носители информации, в которую могут быть внесены изменения, а значит, их осмотр требует участия специалиста, и те из них, которые могут быть осмотрены и изъяты следователем самостоятельно. Такая однозначность поставила под вопрос возможность применения тактических приемов при изъятии носителей цифровой информации в связи с нехваткой специалистов для участия в каждом следственном действии, а значит, время производства следственного действия следователь должен определять не соображениями тактики, а наличием свободного специалиста. Если к этому прибавить проблему острой нехватки достаточного количества специалистов и экспертов, проводящих компьютерно-технические экспертизы, что вызывает очереди в государственных экспертных учреждениях, то

станет очевидной субъективная проблема низкой эффективности противодействия киберпреступлениям – недостаток профессионально подготовленных кадров. Такая проблема характерна именно в сфере борьбы с киберпреступлениями, поскольку, как показывает статистика, с каждым годом в условиях быстро меняющихся технологий меняются и способы совершения киберпреступлений, разрабатываемые преступниками с учетом особенностей функционирования информационно-коммуникационных сетей и оборудования. Выходом может являться только специальная подготовка следователей и оперативных сотрудников органов, осуществляющих оперативно-розыскную деятельность, с последующим ежегодным повышением профессиональной подготовки. При этом подготовка ИТ-специалистов и экспертов в области компьютерных экспертиз должна вестись на базе профильных высших учебных заведений, готовящих специалистов в сфере ИТ-технологий, а не юридических, где невозможно обеспечить базовую техническую подготовку на высоком уровне. Такая практика уже начала складываться в России.

### **УЧАСТИЕ ИТ-СПЕЦИАЛИСТОВ В РАССЛЕДОВАНИИ КИБЕРПРЕСТУПЛЕНИЙ**

Использование специальных знаний выходит на первый план при выявлении и расследовании киберинцидентов должно учитываться при разработке криминалистических программ организации их выявления и начального этапа расследования, когда уголовно-правовая квалификация совершенного преступления еще не ясна. В Российской Федерации в соответствии с классификатором к преступлениям в сфере высоких информационных технологий относятся около двух десятков видов преступлений, что вполне согласуется с положениями Конвенции Совета Европы о киберпреступности (Будапешт, 23 ноября 2001 г.) ETS № 185<sup>5</sup> и Дополнительного протокола к ней (Страсбург, 28 января 2003 г.) ETS № 189. При обнаружении кибератаки на информационный ресурс организации или неправомерного доступа к компьютерной информации гражданина редко можно сразу и однозначно определить, какова цель неправомерного доступа и от кого он исходит. В связи с этим уже разработанные частные методики расследования некоторых видов преступлений не могут быть эффективно использованы следователями. От ученых-криминалистов настоятельно требуется создать родовую (групповую) методику расследования инцидентов с признаками преступлений, совершаемых в сфере информационно-телекоммуникационных технологий. Современные достижения криминалистики в области теории криминалистической характеристики, криминалистической диагностики и прогнозирования позволяют активно начать разработку нового уровня криминалистической методики расследования криминалистически сходных групп преступлений с учетом возможностей криминалистических классификаций преступлений, выявления общих закономерностей в расследовании и создания на этой основе указанной методики. Ее практическая значимость будет заключаться в возможности применения криминалистических методов (программно-целевого, метода статистических связей, моделирования, факторного анализа, комплексного подхода) в момент выявления киберинцидента, раскрытия преступления и начального этапа его расследования, когда выявлены лишь криминалистические признаки возможного преступления, совокупность которых еще не позволяет дать уголовно-правовую квалификацию деянию, а значит применить частную криминалистическую методику расследования.

### **ОРГАНИЗАЦИЯ ВЗАИМОДЕЙСТВИЯ ПРИ РАССЛЕДОВАНИИ КИБЕРПРЕСТУПЛЕНИЙ**

Характерной особенностью такой методики должно быть включение обязательного элемента – использование различных видов и форм взаимодействия на всех этапах выявления и расследования. В отличие от других преступлений рассматриваемая группа характеризуется высокой динамичностью, латентностью, особенностью следообразования, особым обращением с цифровыми доказательствами, требующим использовать узко

5 Вступила в силу с 1 июля 2004 года.



специальные знания, навыки и оборудование, что, в свою очередь, обуславливает особые виды взаимодействия, а именно: между различными подразделениями правоохранительных ведомств; между их территориальными подразделениями; между правоохранительными органами различных ведомств, уполномоченными расследовать указанные виды преступлений; между правоохранительными органами и организациями – жертвами кибератак, особенно имеющими собственные службы экономической и информационной безопасности (например, кредитными организациями); между жертвами кибератак и организациями, способными оказать содействие в предупреждении и в расследовании киберинцидента: антивирусными компаниями (лабораториями), консалтинговыми компаниями, компьютерными группами реагирования на чрезвычайные ситуации (CERT)<sup>6</sup>; между правоохранительными органами и организациями, способными оказать содействие в раскрытии и расследовании преступлений путем выделения специалистов, консультирования, поиска и закрепления цифровых доказательств и др., каковыми являются CERT<sup>7</sup>. Наконец, не менее важным видом взаимодействия является сотрудничество правоохранительных органов разных стран, чьи территории затронуты киберинцидентом. Такое взаимодействие может осуществляться в самых разнообразных формах, и их развитие и расширение должно быть предметом научных разработок с тем, чтобы сформулировать взвешенные, конкретные, реальные предложения для обсуждения мировым сообществом и внесения в соответствующие международные правовые акты.

### **НЕОБХОДИМОСТЬ МЕЖДУНАРОДНОГО СОТРУДНИЧЕСТВА ПРИ ВЫЯВЛЕНИИ И РАССЛЕДОВАНИИ КИБЕРПРЕСТУПЛЕНИЙ**

Особенно важно развивать международное взаимодействие в режиме реального времени, минуя письменные запросы о правовой помощи, что позволит создать инструмент моментального реагирования на международные кибератаки и стать залогом сбора цифровых доказательств в полном объеме.

В настоящее время для получения правовой помощи из-за рубежа Россия направляет соответствующие запросы запрашиваемым сторонам в соответствии с Европейской конвенцией о взаимной правовой помощи по уголовным делам (Страсбург, 20 апреля 1959 г.) ETS № 030 и Дополнительным протоколом к ней (Страсбург, 17 марта 1978 г.) ETS № 099. Для получения помощи от стран СНГ используются возможности, предоставляемые Конвенцией о правовой помощи и правовых отношениях по гражданским, семейным и уголовным делам (Минск, 22 января 1993 г.). Однако взаимодействие государств по вопросам правовой помощи в рамках названных конвенций удовлетворяют стороны не в полной мере, поскольку предусмотренные ими виды помощи не соответствуют реалиям информационного общества. Особенно это касается получения электронных доказательств за рубежом.

Решить названные проблемы могли бы Конвенция Совета Европы о киберпреступности (Будапешт, 23 ноября 2001 г.) ETS № 185 и Дополнительный протокол к ней (Страсбург, 28 января 2003 г.) ETS № 189, которые, к сожалению, до настоящего времени не ратифицированы Российской Федерацией по причине несогласия с положениями п. в ст. 32 «Трансграничный доступ к хранящимся компьютерным данным с соответствующего согласия или к общедоступным данным», в соответствии с которым Сторона может без согласия другой Стороны получать через компьютерную систему на своей территории доступ к хранящимся на территории другой Стороны компьютерным данным или получать их, если эта Сторона имеет законное и добровольное согласие лица, которое имеет законные полномочия раскрывать эти данные этой Стороне через такую компьютерную систему. По мнению представителей Российской Федерации, данное положение может нанести ущерб суверенитету и национальной безопасности государств-участников, правам и законным интересам их граждан и юридических лиц.

<sup>6</sup> CERT – Computer Emergency Response Team.

<sup>7</sup> В настоящее время в России такое взаимодействие успешно развивается между правоохранительными органами и международной компанией по предотвращению и расследованию киберпреступлений и мошенничеств с использованием высоких технологий «Group-IB».

Поскольку автор является сторонником ратификации Конвенции о киберпреступности, стоит привести некоторые аргументы в пользу ее ратификации. Конвенция охватывает три основных направления: согласование национальных норм, определяющих составы преступлений; определение порядка расследования по преступлениям в глобальных компьютерных сетях; создание оперативной и действенной системы международного сотрудничества по борьбе с киберпреступностью.

В ней закреплены основные нормы, облегчающие расследование компьютерных преступлений с использованием новых форм взаимопомощи. Они предусматривают защиту хранящихся в компьютерах данных, хранение и оперативное представление данных об интернет-трафике, поиск и арест систем, используемых преступниками, динамическую фиксацию трафика и перехват сетевого контента. В интересах соблюдения прав человека и принципа соразмерности действие этих норм ограничивается условиями и гарантиями, предусмотренными национальными законодательствами государств-участников. Так, например, следственные действия могут быть начаты лишь с санкции суда или иного независимого органа.

Наряду с традиционными формами международного сотрудничества Конвенция о киберпреступности предусматривает возможности правоохранительных органов одних государств собирать хранимую в компьютерах информацию и доказательства для правоохранительных органов других государств, не проводя при этом специальных трансграничных расследований. Собираемая таким образом информация должна оперативно передаваться по назначению. Для оказания содействия в текущих расследованиях уже создана постоянно действующая круглосуточная система связи в виде центров G 24/7.

Конвенция в качестве нового метода расследования предусматривает «поиск и конфискацию сохраненных компьютерных данных». Данная норма позволяет стороне добиться сохранения важной информации, необходимой для расследования преступления, находящейся в юрисдикции другой стороны. Провайдеры услуг Интернет, как правило, располагают данными об информационном обмене сообщениями в прошлом, которые можно получить с помощью оборудования, регистрирующего конкретные аспекты информационного обмена, включая время, продолжительность и дату любого сообщения. Такие данные хранятся обычно в течение ограниченного периода времени, зависящего от коммерческих потребностей оператора или поставщика услуг, а также от юридических требований, касающихся неразглашения частной информации.

Национальное законодательство многих стран разрешает правоохранительным или судебным органам издавать распоряжение, касающееся сбора данных информационного обмена. В то же время в тех случаях, когда данные информационного обмена являются частью сообщения, например «заголовок» сообщений, передаваемых по электронной почте, сбор таких данных может рассматриваться как перехват самого сообщения и по этой причине подпадать под юридические ограничения. Именно такая практика распространена в России.

Значимым в рассматриваемом контексте является положение Конвенции, которое дает возможность принимать законодательные и другие меры, уполномочивающие ее компетентные власти арестовать или подобным образом обезопасить от уничтожения данные, которые имеются у провайдера и необходимы для расследования. Положения статьи Конвенции — «Быстрая консервация данных, сохраненных в компьютерной системе» и статьи — «Быстрая консервация и раскрытие данных трафика» дают возможность правоохранительным органам проводить расследование таких преступлений или предпринимать действия для сохранения данных, которые могут быть уничтожены по истечении определенного времени, что, безусловно, позволит получить важные доказательства. В условиях России такое положение может быть реализовано путем дополнения УПК РФ нормой о введении такого следственного действия, как арест электронной корреспонденции.

Анализируя современный уровень международного взаимодействия и оказания правовой помощи, мы пришли к выводу о необходимости применения более эффективных мер помощи в расследовании компьютерных инцидентов, нежели направление запросов о правовой помощи в страны, где могут находиться доказательства преступления. Мы имеем ввиду осуществление совместных расследований, то есть формирование интер-

национальных (международных) оперативно-следственных групп в случаях, если совершено транснациональное преступление, каковыми, например, являются организация бот-сетей, осуществление мошенничества с использованием дистанционного банковского обслуживания (ДБО) и другие преступления в сфере информационно-телекоммуникационных технологий. Это означает, что совершение преступления организовано группой лиц с использованием средств вычислительной техники с территории нескольких стран. Предмет посягательства также может находиться на территории не одного государства, кроме того обналичивание похищенных средств происходит на территории иных государств. В таком случае цифровые и иные доказательства могут находиться на территории нескольких стран. Если принять во внимание современную тенденцию киберпреступников к более тщательному планированию и сокрытию (уничтожению) следов преступления, а также оценить скорость направления и исполнения запросов о правовой помощи по собиранию доказательств на территории запрашиваемых сторон, то решение о необходимости вести расследование на территории нескольких стран одновременно напрашивается само собой. Тем более что для этого есть предпосылки. Ст. 19 Конвенции ООН против транснациональной организованной преступности от 15 ноября 2000 г. и ст. 49 Конвенции ООН против коррупции от 31 октября 2003 г. предусматривают возможность заключения двусторонних и многосторонних соглашений или договоренностей, в силу которых в связи с делами, являющимися предметом расследования, уголовного преследования или судебного разбирательства в одном или нескольких государствах, заинтересованные компетентные органы могут создавать органы по проведению совместных расследований.

Нормативного регулирования в сфере действующего уголовного судопроизводства России пока недостаточно для осуществления такой формы взаимодействия. Ст. 457 УПК РФ позволяет представителю запрашивающей стороны присутствовать при исполнении международного поручения о правовой помощи, но этого явно недостаточно. Особенности компьютерных преступлений предполагают немедленное реагирование на инцидент и собирание цифровых доказательств, в том числе в режиме реального времени. В связи с этим проведение следственных действий уполномоченными лицами одновременно на территории нескольких государств может повысить эффективность борьбы с преступлениями, в том числе обеспечить их своевременное пресечение и минимизировать причиняемый ими вред гражданам, организациям и государствам. Полагаем, что в результате совместных международных расследований могут быть решены следующие важные задачи:

- обеспечена оперативность пресечения преступлений и их расследования, поскольку неактуальной станет процедура направления письменных запросов о правовой помощи и выдаче преступников, соответственно расследование будет осуществляться в разумные сроки, что способствует соблюдению прав обвиняемых на скорый суд;
- достигнута эффективность (объективность, полнота и всесторонность) расследования вследствие получения на территории разных стран доказательств, отвечающих требованиям допустимости без их дополнительной проверки;
- использование при расследовании не только информации, полученной на территории другой страны, но и доказательств, в том числе вещественных, заключений экспертиз и других;
- применение наиболее актуальных методик расследования с учетом конкретных следственных ситуаций и достижений криминалистики в разных странах;
- возможность использования помощи специалистов наиболее высокого уровня при назначении экспертиз и помощи при производстве следственных действий.

Однако ставить вопрос о проведении совместных расследований киберпреступлений, а иногда даже и об оказании правовой помощи, невозможно, если внутренним правом одной из сторон не предусмотрены конкретные полномочия на поиск доказательств в электронной среде. Полагаем, что ратификации Конвенции о киберпреступности как можно большим количеством государств позволит изменить ситуацию, поскольку обяжет страны-участницы пересмотреть и по-новому урегулировать правила сбора, поиска, изъятия электронных доказательств с учетом глобальной природы сети Интернет. Соответствие процедурных законов облегчило бы сотрудничество в расследованиях преступлений, совершенных в нескольких государствах.

## ГАРМОНИЗАЦИ МЕЖДУНАРОДНОГО И НАЦИОНАЛЬНОГО ЗАКОНОДАТЕЛЬСТВА

Для достижения перечисленных выше целей необходима реализация еще одного важного направления - гармонизации национального и международного уголовного законодательства по противодействию киберпреступности. Прежде всего, речь идет об унификации норм национального законодательства в части уголовно-правового определения понятия киберпреступление и выделения его существенных признаков. Данный термин до сих пор не имеет однозначного толкования не только в различных правовых системах, но и в разных международных актах. Необходимо согласиться с теми учеными, которые считают, что «принимаемые нормы должны быть по возможности технологически нейтральными, т. е. не должны зависеть от конкретных технологических изменений в средствах, используемых преступниками для достижения противоправных целей».<sup>8</sup> Техника и технологии сменяются быстро, что автоматически отражается на действии закона: существующий закон перестает действовать, а использование новых объектов и явлений при совершении преступления остается вне уголовной юрисдикции. Такую ситуацию используют преступники, перенося объекты кибератак на территории тех государств, где отсутствует уголовная ответственность за определенные разновидности киберпреступлений или отсутствуют процедурные возможности эффективного собирания доказательств.

### ЗАКЛЮЧЕНИЕ

Перечисленные нами меры важны не только для осуществления расследования на территории России, но и для международного сотрудничества по делам о компьютерных преступлениях. Полагаем, что без возможности осуществления указанных мер нельзя рассчитывать на успех в противодействии преступлениям, совершаемым в сфере высоких информационно-телекоммуникационных технологий, принимая во внимание их специфику.

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## HANDWRITING SIGNS OF NOT DOMINANT HAND

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**Abstract :** Writing by not dominant hand is often used in falsification – to cover own handwriting. Translated article is focusing on scientific investigation of the above. The paper also addresses questions of occurrence of the same signs of manual fond of dominant and not dominant hand. It is fairly important piece of information in determining the conclusion in studied handwriting. Based on the findings we cannot be sure that text written by not dominant hand without practice is containing exactly the same signs of that with dominant hand. After the appropriate training in getting skills to write with not dominant hand, handwriting started to show more and more individual fond characters. The difference begins to shrink, until it totally disappears. The dominant and not dominant hands become identical.

**Keywords:** handwriting, dominant hand, not dominant hand, lateral writer (scribe)

### INTRODUCTION

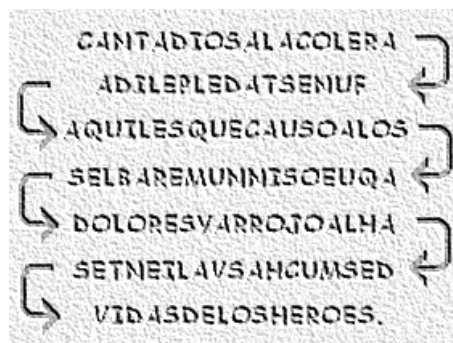
Writing by non-dominant hand is often used in falsification – to cover own handwriting. This writing is interesting also because it is often used in research to scientifically examine the ability to write, create and change one's own handwriting. Mainly the following question is of importance: what is decisive contribution when creating graphical characters of handwriting? Mostly, an influence of spinal muscle apparatus, conditions of writing – location and writing tools, mental state of the writer or, prevailingly, influence of consciousness – brain activity when remembering graphical characters of writing while learning how to write, these all are taken into consideration when searching for the possibilities of influencing the stereotype. In certain close up – with rather big probability, it is possible to consider the writing by non-dominant hand identical with writing written by any body part of a writer (writing by foot, mouth, the whole body etc.).

### WAYS TO WRITING

Some researchers have thought that direction of reading and writing expresses handedness (left, right) given by evolution of civilization. It was believed that right handedness is characterized by reading and writing from left to right and for left handedness it is the opposite. Many factors, however, are against this belief. For example Egyptian hieroglyphs had been written either top down in the columns or horizontally, from right to left or vice versa. Various rules applied – pictures of animals and people had been turned towards the beginning of the text. Numbers were written from right to left. Chinese and Japanese write with sign language in columns, bottom up, and they start top right. Old Mexican writing was written in columns bottom up. Indians write left to right, Jews and Arabs the opposite way: right to left but numbers write left to right since these have been taken over from Indians.

Apart from these ways of writing there had been once very interesting way of writing which had been spread and used mostly with Hittites and later named „boustrophedon“ by the Greeks (gr. *βουστροφηδόν*).





Picture 1 Boustrophedon

Phoenicians, old Greek and Etruscans originally wrote right to left. Later, however, Greeks accepted a way where each following line started where the previous one ended. This writing was similar to ploughing the soil and the Greeks named it writing with „ox turn“ boustrophedon (Picture 1).<sup>1</sup> Finally, Greeks also started writing left to right. In our cultural area we have a situation where Indo-European nations write left to right but Jews and Arabs write right to left. In both ways – writing directions – writing with right hand prevails.

The way of writing practice in our central European conditions may not be the most efficient in terms of biomechanics. In our view, the dominant right-handed writing is more natural to write from right to left. Based on that our way of writing (given by the school norm), following the rules of biomechanics, is not natural. It is so for the right, in most cases the dominant, hand which, when writing from left to right, we „push“ against more natural movement from right to left. As well as for the dominant left hand writing from left to right is more natural, but it is not natural to write in Roman characters, because “left handed” writers rotate a line so that the writing movement is almost perpendicular. This means that writing with Latin alphabet in our European conditions is not fully (in terms of biomechanics) natural.

The most critical period in the evolution of laterality of hands is the period between the fifth and seventh year of life. During this period, development of the finest the executive body of nature - frontal lobe of the brain - is being completed. Violent practicing of natural development of lateral dominance of writing can seriously harm the development of brain mechanisms for the lifetime of the person.

## PHYSIOLOGY WRITING

Although the biomechanical content of handwriting reflects mostly biological characteristics of the writer and the state of his body, climatic and dynamic characteristics, functional and dynamic states of the organism and surrounding conditions, **the decisive factor that affects the graphical aspects of the writing is physiology of writing - an acquired ability gained by conscious training to use the writing to capture mental processes.**

When writing there are two groups of factors interacting. In the first group it is - normal automatic functioning joints and muscles of the arm, hand and finger movements, visual impressionability, visual memory, trained controlling eye that controls next to the numerous actions of the person also written formations reproduced on clipboards. In the second group there are factors - perfect control of tools for writing, perfect control of font shapes, perfect command of the language in which we write.

In case of dissolution of any ability from the first group, nature can help by raising other skills to such a level that for a person it would be very difficult and very rare to reach it. Under these circumstances, writing is initially a torment and handwriting differs considerably from the previous writing that was created automatically. However, if this condition is permanent and

<sup>1</sup> Keki, B.: *5000 let písma*. Praha: Mladá fronta, 1984

immutable the whole organism adapts to the new state of affairs. Writing is thus performed only by arm movement - instead of moving fingers and hand, handwriting becomes automatic again and turns slowly to the previous handwriting.

If there is a loss of dominant hand and therefore it is being written by non-dominant hand, gradually similar experiences start to appear. If there is a loss of both hands we begin to write feet or mouth font, similar to the previous font,

Based on the above mentioned, writing of both dominant and non-dominant hand shows consistent signs of handwriting by non-dominant hand and that is after irreversible damage or loss of the dominant hand.

According to statistics, altering the handwriting, or its falsification by using the left, non-dominant hand, does not occur often, yet it is still preferred because it causes "change of the handwriting at first sight". This way, natural typing speed is greatly reduced. The irregularity and clumsiness of this writing brings shapes of letters that are different from the shapes of letters when writing by dominant hand. This unusual way of writing makes the writer aware of the writing by school standards and therefore individual letters of such a fake text are more or less similar to writing by school standards.

If the writer continues to get skills to write with left-hand, individual shapes would start appearing and variations of this writing with writing with dominant hand would begin to shrink until they almost completely disappear.

## THE WRITING WITH THE NON-DOMINANT HAND

The main feature of the writing with the non-dominant hand are the turns in the direction corresponding to the non-dominant hand, this means that when writing loops there is a reverse of the upper loops from left to right and with lower lobes right to left (i.e. opposite to the left-handed writing). In any case, these changes are very noticeable and are caused more by movement patterns rather than visual imagination.

A special feature of the non-dominant hand writings are also separate "threads" towards the basic movements, especially at letters with a loop. These are explained as sudden corrections during a certain turn. When identifying problems are emerging and to be ever able to compare, tests of writing of the same type are necessary – when testing handwriting, writing with non-dominant hand should be required.

In our research we wanted to answer the question whether identical characters are exhibited in writing written by dominant and non-dominant hand of the same writer without prior training and without irreversible damage or loss of the dominant limb.

This was verified in cursive writing but also in bubble writing.














It is not possible to clearly confirm a lay hypothesis that the slope of the writing of non-dominant hand is to the left. In fact, we can say that writing by non-dominant hand is more upright.

Dynamic pressure with the non-dominant hand, matched in only about 13 percent so the hypothesis of "untrained/unused" non-dominant hand, can be considered confirmed. Match of static pressure manifests itself in total of 76% but does not clearly confirm that the reason of "untrained/unused" non-dominant hand is strong or weak static pressure. It is very individual and it depends on the individuality of the writer, which cannot be quantified.

Fixed writing movement is detected in only about 3% of the writers, which in fact confirms the lay hypothesis about „untrained“ non-dominant hand.

Matching binding of letter 'a' is expressed in 70% of the writers which is very interesting. It is likely that after practice the matching is even deeper.



	Way of letter "a" binding
	according the school norm
	wrapped oval
	loop connection
	narrow oval with straight backward stroke
	closed oval with deep backward covered stroke
	unclosed oval with deep backward stroke
	system of the clockwise arc with a handle and backward stroke, which is led over the initial stroke
	system of the clockwise arc with a handle and backward stroke, which is led under the initial stroke
	system of the clockwise arc with a sharp turn and backward stroke led under the initial stroke
	clockwise arc passes into the left hand arc
	angle stroke with a sharp turn and backward left-hand arc that intersects with the initial stroke
	angle stroke with a sharp turn and backward left-hand arc that leads under the level of initial stroke
	long straight stroke with sharp angle and left-hand arc that leads above the initial move

Similarly, we have proceeded in examining the letter „k“. Matching of letter „k“ is different according to the upper part - loop making, the upper loop size and lower loop shape. Generally it can be said that the letter „k“ in the handwriting of non-dominant hand is getting closer to school standard.

Based on identified facts it is not clearly possible to say that in the writing of non-dominant hand, which is written without training, there are identical characters to handwriting of dominant hand. In none of the 70 examined handwritings absolute match has not appeared. The number and combination of matching characters is very individual.

Neither with bubble font can it be said conclusively that all characters in the writing of dominant hand occur in the non-dominant hand writing without training. Here, too, the number and combination of identical characters are very individual.

But in any case we would not come to the conclusion that the dominant features of handwriting by dominant and non-dominant hand are absolutely identical without prior training.

## CONCLUSION

If we remember how the process of writing teaching progressed, we realize that at the beginning imitation of written characters, writing of slanting strokes, loops, arches and meanderings, and their connection to basic components, and then in connecting syllables and eventually into joining words presents significant challenge. Later, writing gets automated so that we even do not think about how we write, but what we write.

Writing is affected by both, external as well as internal factors. It is the result of complex neural, mental and motor activities. From a physiological point of view, it can be taken as established that the writing process happens according to complex patterns of analytic-synthetic activity of the cerebral cortex, and that it is managed centrally from nerve headquarters. Practice and research have shown that different people have, even in cases of similar bodily disorders, preserved their individual handwriting.

Temporal nerve disruption or permanent mental disorders may be shown in the writing, but the stability of characters in the handwriting is essentially unchanged. Elaborate dynamic stereotype can be transmitted from one effectoral system (in physiology and psychology: the executive body, which responds to the irritation of the relevant receptor) to another without any problems.

Generally speaking, the individuality of the writer affects their handwriting the same way as it reflects in the number of identical characters in a handwriting written by non-dominant hand. Based on the findings it cannot be clearly demonstrated that the non-dominant hand written handwriting without prior training includes absolutely identical characters with characters written by dominant hand handwriting.

After appropriate training in acquiring skills to write by non-dominant hand, individual characters of dominant hand writing started gradually to appear. Differences begin to shrink, until they disappear almost completely. Handwriting of dominant and non-dominant hand becomes identical.

Influences that affect the number of identical characters are given by physiological factors, motor factors and laterality of the writer. Most identical characters were found in the handwriting of a writer, who was retrained to write by right hand as a child. Nowadays we use right hand for writing as the dominant hand. However, the writer is able to write with mirroring handwriting.

It is certainly beneficial for handwriting science to have a research, the results of which can be applied in practice, although we will not come to the clear conclusions that would confirm or refute the hypothesis. The actual handwriting science works with dynamic material, which is influenced by many factors and the conclusion of the research is dependent on the individuality of the writer.

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## SECURITY CHALLENGES OF MODERN TECHNOLOGIES UTILIZATION

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**Abstract:** The rapid developments of modern technology (information and communication technology- ICT and biomedical technology) have been changing dramatically the way we live, thereby creating new problems that never appeared before. Although there are big issues in biomedical technology (human cloning, genetic engineering, stem cell research) our focus is on ICT issues (privacy vs. security, free expression vs. censorship and alike). There are many aspects of deploying new technologies, but we can say that focus is today on virtualization, 'big data' processing, Internet of Things (IoT) and situational awareness as well as developing next-generation security systems, including ones that use human biometrics. This paradigm shift in which everyday objects become interconnected and smart, give a rise to a number of new security challenges such as: general system security, network security, application security and not to forget always present ethical and juridical problems related to privacy issues. The privacy issue is emphasized in case of 'big data' analysis and information processing from distributed data sources (including social media) and large sensor networks. The fusion of social media data with biometric data and traditional surveillance techniques although not yet fully explored but fruitful business territory, is perceived as potentially vulnerable concept for citizens. The aim of this paper is to address the impact of abovementioned technologies on the people lives with specific emphasis on the security&privacy issues.

**Keywords:** Information and Communication Technology, security, privacy, 'big data', Internet of Things, collective awareness

### INTRODUCTION

We are currently living in the so-called *information age* which can be described as an era where all activities are mainly information based. The increasing reliance of modern society on networked computer systems and Internet along with technology impact on the gathering, storage, retrieval and dissemination of information, creates the possibility of wider and simultaneous access to information. Today, services such as electronic mail, peer-to-peer data sharing, Voice-over-Internet Protocol (VoIP), and wireless networks are examples of the technology that enables almost unlimited access to information. This access comes with significant risk since criminals, terrorists, and foreign industrial competitors share this ubiquitous access to information<sup>1</sup>. At the same time (injustice) restriction from necessary information in electronic format by means of a variety of security measures is enabled<sup>2</sup>.

The rapid developments of modern technology (information and communication technology- ICT and biomedical technology) have been changing dramatically our society, modernizing it on the one side but also creating new problems that never appeared before. Big issues recognized in biomedical technology includes (but are not limited to) human cloning, genetic engineering and stem cell research. Some of them are deeply related to moral aspects.

<sup>1</sup> Young MD. (2011). Electronic surveillance in an era of modern technology and evolving threats to national security. *The Free Library*

<sup>2</sup> Britz JJ. (1996). Technology as a Threat to Privacy: Ethical Challenges and Guidelines for the Information Professionals. *Microcomputers for Information Management*, 13(3-4): 175-93

On the other side ICT today has become so essential to modern society that it is taken for granted. Nowadays modern states economy depends on the Internet, their critical infrastructure is controlled by it, national security is empowered by it and yet vulnerable because of it. Deploying of ICT is followed with dilemmas like privacy vs. security, free expression vs. censorship, intellectual property and alike.

There are many aspects of deploying new technologies, but we can say that focus is today on virtualization, 'big data' processing, Internet of Things (IoT) and situational awareness as well as developing next-generation security systems, including ones that use human biometrics. New paradigm shift in which everyday objects become interconnected and smart, give a rise to a number of new security challenges such as: general system security, network security, application security and not to forget always present ethical and juridical problems related to privacy issues. When perform data analysis and information processing from distributed data sources and large sensor networks, one of the 'big data' challenges is an excessive amount of data that needs to be analyzed. In the future, data modality that comes from social media will play a significant role. Integrating social and sensor networks can transform 'big data' into a higher form of collective awareness. On the other side, the fusion of social media data with biometric data and traditional surveillance techniques is an unexplored, but potentially prolific, territory.

Having abovementioned technologies in mind along with the growing number of security attacks it is obvious that today no nation, agency, industry, firm or person is isolated from the cybercrime. Traditional strategies and approaches to security need revision to apply to a world where threats can propagate instantaneously and where the identity or location of an adversary may not be known. Also a number of unique and unprecedented ethical challenges must be properly addressed<sup>3</sup>. By doing so one must understand that no new technology is by definition good or bad. Synergistic science and technology may result in good or evil as determined by how they are used in relation to social norms, ethics and laws<sup>4</sup>. New technologies are adopted for illicit purposes as well as countervailing policing and security purposes.

Having that all in mind, the aim of this paper is to briefly describe the abovementioned technologies and their impact on modern society with specific emphasis on the security&privacy issues.

## MODERN TECHNOLOGY DEVELOPMENT AND TRENDS

As mentioned above, new technology have major impact on people lives. They often simplify tasks, permit the faster responses to inquiries, allow crisis management, and make all form of communication easier. New technology permits access to information practically instantaneously, along with the exchange and sharing of data amongst all public security actors, both on a national and on international level<sup>5</sup>. Although no one can truly predict the timeline of the future technology developments, some anticipated developments over the next decade(s) include virtual property/currencies, smart infrastructure and even interplanetary internet (Fig. 1).

3 Reamer FG. (2001). Eye on Ethics: The Challenge of Modern Technology. *Social Work Today*, October 1, 2001

4 McQuade S. (2006). Technology-enabled Crime, Policing and Security. *The Journal of Technology Studies*, 32(1)

5 Larosa S. (2013). Use of modern technology in the public security sector. *Resolution DOC/CESI-64/2013 of the European Confederation of Independent Trade Unions (CESI)*. Brussels, 12 July 2013

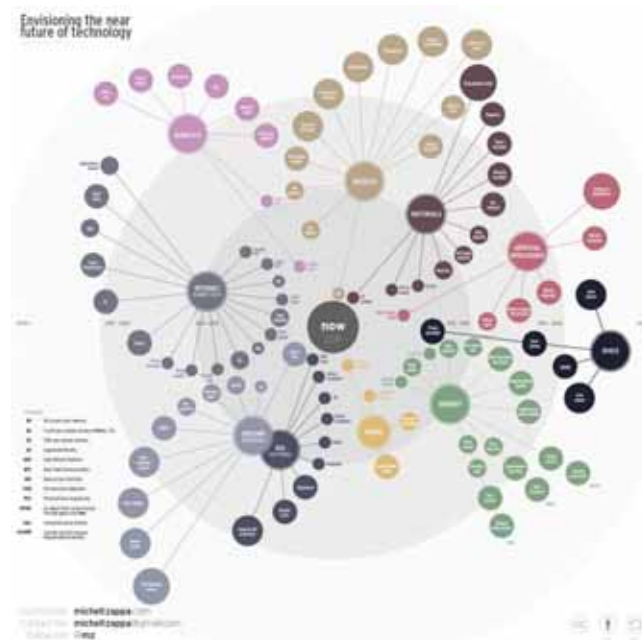


Fig. 1. Envisioning the near future of technology<sup>6</sup>

Report<sup>7</sup> containing an overview of infrastructure, applications, social and economic trends and developments in the next decade stated that:

there is the ongoing convergence of networks and services, and the continued evolution of cellular and other wireless networks and mobile operating systems;

there is more profound change evolving through a more personalized web experience. Rapid expansion of social media and social networking and the use of web-based computing systems like cloud computing, change the way people work and business is conducted;

there is a change in the way content is produced and distributed across multiple platforms.

Particularly in the domain of infrastructure the following trends are foreseen<sup>8</sup>:

**Computer processing power** is increasing and eventually will enable 'supercomputer-level' processing in commodity computer hardware.

**Cross-platform media** - a change in the way content is produced and distributed across multiple platforms is evident. Experiments, with new and creative ways of content distribution among distinctive platforms, without the need to reformat the information, are conducted.

**Virtualization and cloud computing** - Virtualization of data centers is not a new concept, but the focus now is shifting from virtualization of servers to virtualization of all other service providing resources (e.g. switches, routers, and storage) within data centers. Technical factors behind the growth of cloud computing include the more widespread deployment of wired and wireless broadband networks, improvements in storage capacity and the proliferation of hand-held devices with powerful processors that can access the web.

**IPv6** - the enhanced version of the internet protocol which offers more efficient routing, better provision for both quality of service and mobility, enhanced security and enough address space to enable an 'Internet of Things' and so-called 'Smart Networks'.

In the domain of applications the following web trends are foreseen:

<sup>6</sup> <http://www.united-academics.org/magazine/design-technology/data-visualization-envisioning-the-near-future-of-technology/>

<sup>7</sup> *Trends in Communications and Media Technology, Applications and Use.* (2009). Australian Communications and Media Authority.

<sup>8</sup> *Ibid.*

**The web continues to evolve through developments in location-based services (LBS).** Location-based services (LBS) use details about the physical location of a user or device to provide tailored or targeted information. A user's location can be determined using the Global Positioning System (GPS) or cellular tower location. Location-based services reveal whether other people and objects of interest are in close proximity to the user (for example, friend, restaurant, map directions etc.).

**Web experiences are to be more personalized.** A possible trajectory for web developments (Fig. 2) predicts moving from the social web at present through to the semantic web era (2010–2020) and on to the intelligent web<sup>9</sup> (2020–2030).

The **first** generation of the web was characterized as the **Information Age** that enabled *search* functions.

With the emergence of the **second** generation (Web 2.0) over the early part of this decade, the story of the web has largely been about *interaction*. It became known as the **social web**.

Currently in the early stages of development, the **semantic web** (or Web 3.0) is expected to provide a more personalized web experience by *anticipating* and delivering information of interest to individual users.

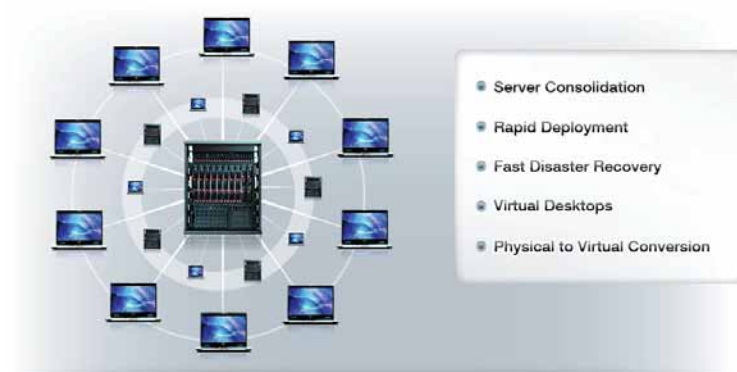


Fig. 2. Beyond the limits of keyword search—a possible trajectory of web developments<sup>10</sup>

## VIRTUALIZATION AND CLOUD COMPUTING

Virtualization is the creation of a virtual (rather than actual) version of something, such as an operating system, a server, a storage device or network resources<sup>11</sup>. Virtualization technology eliminates 'one server, one application' model and runs multiple computers on one physical machine through virtualization. Virtualization frees up IT administrators to concentrate more on innovations rather than maintenance. Virtualization provides flexibility with features like live migration, storage flexibility, greater scalability, improved performance and minimum or zero downtime (Fig. 3). An important business and social benefit of virtualization comes from the effective use of what would be under-utilized computing resources. With its cost savings and flexibility benefits proven, virtualization has moved from a 'nice-to-have' to 'must-have' technology.

<sup>9</sup> The intelligent web refers to smart applications and smart services enabled by metadata that describes the meaning of data and the logical relationships between data and concepts

<sup>10</sup> <http://www.urenio.org/2011/11/17/semantic-web-for-smart-cities/>

<sup>11</sup> <http://searchservvirtualization.techtarget.com/definition/virtualization>





Fig. 3. Benefits from virtualization technology<sup>12</sup>

Virtualization of data centers is not a new concept, but the focus now is shifting from virtualization of servers to virtualization of all other service providing resources (for example, switches, routers, and storage) within data centers. Virtual resources will combine physical resources that can be accessed across the data centre, the network or the world and to the application, it will seem like a single, stand-alone local resource. The following trends are driving advancements in virtualization technology<sup>13</sup>:

Newer applications – Business innovation and agility drive the need for more system and integration flexibility;

Device proliferation – The number of nodes on networks has grown considerably;

Data explosion – The exponential growth of available data creates significant challenges for IT.

To address the challenges of new applications, device proliferation, and data explosion, organizations need to take new approaches for effectively and efficiently harnessing the latest IT innovations in a converged datacenter infrastructure. The solution is found in Cloud computing.

Cloud computing refers to the use of web-based computing systems, applications and services that are accessed independently from the underlying infrastructure. This enables computing services to be available where and when needed. With cloud computing, access can be via a high-speed connection so that there are fewer limitations on the data that can be exchanged with the server. Global connectivity enables the user to have access to computing facilities and data storage that could be located anywhere around the globe (Fig. 4). In common usage, the term ‘the cloud’ is essentially a metaphor for the Internet<sup>14</sup>. Marketers have further popularized the phrase ‘in the cloud’ to refer to software, platforms and infrastructure that are sold ‘as a service’, i.e. remotely through the Internet.

#### Security&Privacy Issues

We can say for sure that virtualization and cloud computing issues are in close relation. The design, implementation, and deployment of virtualization technology have opened up novel threats and security issues which, while not particular to system virtualization, take on new forms in relation to it. Reverse engineering becomes easier due to introspection capabilities, as encryption keys, security algorithms, low-level protection and intrusion detection can become more easily compromised. Furthermore, associated technologies such as virtual routing and networking can create challenging issues for security, intrusion control, and associated forensic processes<sup>15</sup>. Another issue with virtualization is the complexities of licensing, although some vendors of proprietary software have updated their licensing schemes to address virtualization.

12 [http://www.three.org/Tthree2.0/Systems/Sy\\_VirtualizationTechnology.aspx](http://www.three.org/Tthree2.0/Systems/Sy_VirtualizationTechnology.aspx)

13 <http://www.bcgsystems.com/blog/bid/80436/How-To-Go-Beyond-Virtualization-with-Windows-Server-2012>

14 [http://www.webopedia.com/TERM/C/cloud\\_computing.html](http://www.webopedia.com/TERM/C/cloud_computing.html)

15 Pearce M, Zeadally S. and Hunt R. (2013). Virtualization: Issues, security threats, and solutions. *ACM Comput. Surv.* 45(2):Article 17



Fig. 4. Cloud Computing diagram<sup>16</sup>

On the other side there are several deterrents to the widespread adoption of *cloud*. Among them, are: reliability, availability of services and data, security, complexity, costs, regulations and legal issues, performance, migration, reversion, the lack of standards, limited customization and issues of privacy.

Privacy and confidentiality concerns arise because the service provider necessarily has access to all the data, and could accidentally or deliberately disclose it or use it for unauthorized purposes<sup>17</sup>. Privacy advocates have criticized the cloud model for giving hosting companies greater ease to control (to monitor?) communication between host company and end user, and access user data (with or without permission). A cloud service provider (CSP) can complicate data privacy because of the extent of virtualization (virtual machines) and cloud storage used to implement cloud service<sup>18</sup>. Outsiders can also gain access to unencrypted data through file-sharing services used by employees (e.g. Google Drive).

CSP operations, customer or tenant data may not remain in the same system, the same data center or even within the same cloud provider's systems. Conceivably, data may even be stored in another country, incurring considerable legal concerns over jurisdiction.

The accumulation of data in the cloud will offer attackers more attractive targets. Wide adoption of cloud services has allowed cybercriminals to use reputable services to bypass many of the digital defenses erected by companies. In addition, technically sophisticated cybercriminals have created their own cloud services, so that anyone intent on utilizing compromised systems can sign up and immediately lease a botnet or purchase other illicit services.

A possible response to some concerns would be, along with the improved network security, to offer virtual private cloud computing with service-level undertakings. IT security professionals should also look to secure access to sensitive data in the cloud by using two-factor authentication, making access to the data more difficult for attackers. Also often encryption need to be implemented before the data is exported to the cloud.

## SOCIAL NETWORKING AND INTERNET OF THINGS (IoT)

A social networking service is a platform to build social networks (or social relations) among people who share interests, activities, backgrounds, or real-life connections. Most social network services are web-based and provide means for users to interact over the Internet. Social

<sup>16</sup> <http://techbuddha.wordpress.com/2009/03/29/on-conficker-the-return-of-the-high-profile-mass-infection-worm/cloud-2/>

<sup>17</sup> Ryan MD. (2011). Cloud computing privacy concerns on our doorstep. *Commun. ACM*, 54(1):36-38

<sup>18</sup> Winkler V. (2011). *Securing the Cloud-Cloud Computer Security Techniques and Tactics*, Elsevier, Waltham, USA

networking sites<sup>19</sup> allow users to share ideas, pictures, posts, activities, events, and interests with people in their network.

Social networking is being deployed within enterprises as well. Online social networks are being used for web-based business networking, job hunting and for connecting with customers online. Web-based collaboration through blogs, wikis and social networking sites enables enhanced employee collaboration, inside and outside an organization. Companies have begun to merge business technologies and solutions, such as cloud computing, with social networking concepts. Instead of connecting individuals based on social interest, companies are developing interactive communities that connect individuals based on shared business needs or experiences. The functionality of social networking is expanding as online social network providers add mobile interfaces to their services. At the forefront of emerging trends in social networking sites is the concept of *real-time web*<sup>20</sup> and *location-based services*.

The Internet of Things (IoT) is considered as emerging network paradigm in which each physical object is mapped as one (or more) cyber entities that can mutually interact with each other, enabling pervasive connectivity through technologies like RFID, wireless communication, real-time localization and sensor networks<sup>21, 22</sup>.

Today there are more and more devices connected to the Internet, with personal computers and servers outnumbered by smart phones and other mobile devices. Yet, mobile devices are already being surpassed by sensors, consumer devices, industrial control systems, and other 'things' that are quickly being connected to the network. From embedded systems to home automation, industrial control systems to consumer devices, the Internet of Things will only expand and become a more integral part of businesses and people's lives, making security and privacy important features of such systems (Fig. 5). This paradigm shift in which everyday objects become interconnected and smart, give a rise to a number of new challenges such as: general system security, network security, application security and not to forget always present privacy issues.



Fig. 4. The Internet of Things<sup>23</sup>

### Security&Privacy Issues

Social networking can have tremendous benefits but also can have serious security risks both for organizations and individuals. The threats can be broadly classified into two categories: those related to end user behavior (insufficient authentication controls, phishing, information leakage, and information integrity), and those that are related to security vulnerabilities within the application. A combination of proper end-user security along with secure coding practices and verifications should therefore help mitigate both sets of risks.

<sup>19</sup> Facebook and Twitter are among most popular

<sup>20</sup> Real-time allows users to contribute contents, which is then broadcast as it is being uploaded - the concept is analogous to live radio and television broadcasts

<sup>21</sup> Feki MA, Kawsar F, Boussard M, Trappeniers L. (2013). The Internet of Things: The Next Technological Revolution. *Computer*, 46(2):24-25

<sup>22</sup> Ning HS., Liu H., Yang LT. (2013). Cyberentity Security in the Internet of Things. *Computer*, 46(4): 46-53

<sup>23</sup> <http://animikh.in/industrial.html>

Privacy on social networking sites can be undermined by many factors. For example, users may disclose personal information, sites may not take adequate steps to protect user privacy, and third parties frequently use information posted on social networks for a variety of purposes. Furthermore, there is an issue over the control of data since information that was altered or removed by the user may in fact be retained and/or passed to third parties. A potential privacy concern arises from network management practices that incorporate location aware services and use of personal information for behavioral marketing. Through *data mining*<sup>24</sup>, companies are able to improve their sales and profitability. With this data, companies create customer profiles that contain customer demographics and online behavior. Therefore striking a balance between promoting innovation and protecting user privacy are important policy considerations. Also the fusion of social media data with traditional surveillance streams is an unchartered, but potentially fertile, territory.

Another issue is technology utilization for criminal purposes. The technology provides anonymity, convenience, and rapid communication through e-mail, peer-to-peer connections and voice over internet protocol (VoIP). Social networks provide forums for extremists to share their ideologies and their techniques and procedures for conducting illicit activities. They also use Internet to foster public awareness of and sympathy for their causes, and even to execute operations<sup>25</sup>.

The Internet of Things continues to expand, but security remains untested. Two of the greatest risks to organizations are malware (malicious software designed to intrude or damage a computer system without a user's informed consent) and inadvertent disclosure of sensitive information<sup>26</sup>. Malware has already infected devices such as digital picture frames and network appliances, and detecting such compromises continues to be difficult. Mac OS and mobile-device platforms are also compromised. The ability of automated systems to handle malware analysis will be further compromised by the increasing use of DRM<sup>27</sup>-like techniques for locking malware to infected systems. Recently Dell Company, the leading computer system manufacturer, announced that in its servers' line PowerEdge malicious program has been found embedded in a flash memory of a motherboard<sup>28</sup>. Thus, the computer industry has been faced with the threat of computers' infection with malicious software, but at the level of firmware<sup>29</sup>.

There is a major problem when a critical infrastructure systems (including energy, water, and other industrial control systems-ICS) are found to be connected to the Internet in a way they were never intended to. In such a case it is expected that their vulnerability will be targeted. The threat is not theoretical. In recent years the ICS have proven to be vulnerable to cyber attacks, which could have serious and deadly consequences such as equipment malfunctions and the interruption of public services<sup>30</sup>. Hackers have already targeted the systems with high-profile malware packages including Stuxnet, Duqu, Flame and Gauss<sup>31</sup>. In fact in 2009, the Stuxnet<sup>32</sup> attack used specialized knowledge of ICS used by Iran for uranium processing to destroy much of that nation's refinement capability. The media has also reported that computer-controlled electric power grids are 'plagued with security holes that could allow intruders to redirect power delivery and steal data....'<sup>33</sup>

A significant problem for devices connected to the Internet will be in handling security updates without putting the devices at risk of compromise. Detecting compromised and counterfeit devices continues to be resource intensive, though research on fingerprinting devices has advanced. Critical infrastructure companies must find better ways to secure their devices and prevent possible outages.

24 the computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine learning, statistics, and database systems

25 Weimann G. (2005). How Modern Terrorism Uses the Internet. *Security Affairs*, No. 8, Spring 2005

26 <http://www.govtech.com/pcio/CIOs-Social-Media-Security-Risks-021111.html>

27 Digital rights management techniques are used to prevent widespread piracy of digital code. Attackers are refining similar techniques to tie malware to a specific system, preventing the program from being run on another computer, such as the virtual machines widely used to analyze and create signatures for malicious software.

28 <http://www.newscientist.com/blogs/shortsharpscience/2010/07/pc-giant-warns-of-hardware-tro.html>

29 Gharibi W, Mirza, A. (2011). Security Risks and Modern Cyber Security Technologies for Corporate Networks. *IJCSIS*, 9(1)

30 Lemos R. (2012). Companies Need Defenses Against Mobile Malware, *Dark Reading*

31 [http://www.computerworld.com/s/article/9227831/Flame\\_Stuxnet\\_Duqu\\_and\\_more\\_Cyberwarfare\\_coverage](http://www.computerworld.com/s/article/9227831/Flame_Stuxnet_Duqu_and_more_Cyberwarfare_coverage)

32 <http://www.timesofisrael.com/stuxnet-virus-attacked-iran-earlier-than-thought/>

33 <http://online.wsj.com/article/SB10001424052748704905004575405741051458382.html>.

One promising solution for protection against data-stealing malware is pairing the reliability of cloud storage with strong encryption, thus creating a system that is both secure and reliable even when using the public Internet. But very strong security means the loss of both functionality and efficiency.

### **‘BIG DATA’ PROCESSING AND SITUATIONAL AWARENESS**

‘Big data’ refers to massive, heterogeneous, and often, unstructured digital content that is difficult to process using traditional data management tools and techniques. The term encompasses the velocity, complexity and variety of data and data types, real-time data collection, storage and processing needs, and the value that can be obtained by smart analytics<sup>34</sup>.

Distributed data sources are common today and generate a wealth of information, e.g., surveillance cameras, mobile devices, parking occupancy sensors, RFID (proximity) sensors. In another words it is a large sensor network providing all type of data accompanied with the IoT and data from social media in the form of text, images, videos, and sound recordings. Businesses and governments have increasingly focused on collecting and analyzing a wide variety of data to make better decisions through ‘big data’ analytics. Google and other search engines use information on users’ browsing habits to inform search query results and determine what advertisements are displayed. Government agencies collect and process information to look for threats to national security.

However, there exists a gap between the wealth of distributed information captured and the understanding of a scene (and/or context) where the sensors are located. Situational awareness refers to the perception and understanding of what’s happening in a complex environment. It is of great interest in security/surveillance, disaster management, environmental monitoring, etc and a goal for many next-generation security systems, including ones that use human biometrics. Apart to well-known biometric systems based on fingerprint or iris, researchers are now working on authentication systems that can capture biometrics such as skin temperature or facial expression and gait. By comparing them and some other types of data to data of prescreened individuals system can identify criminal suspects or flag potentially suspicious behavior<sup>35</sup>.

Situational awareness methods in practice today often combine sensor measurements with information gleaned from social media. We have visual data analysis in large online repositories (e.g. YouTube, Instagram) and context analysis in social media (e.g. Twitter, Facebook). Integrating social and sensor networks can transform ‘big data’ into a higher form of collective awareness, where search, data mining and visualization technologies make it possible to spot trends and predict the trajectories of higher-level variables<sup>36</sup>. Collective awareness can lead to a more efficient allocation of a resource, ensuring its long-term sustainability.

#### **Security&Privacy Issues**

There are various ‘big data’ challenges due to the prohibitive amount of data that needs to be analyzed. The first problem with ‘big data’ is it’s so vast and unorganized, that organizing it for analysis is no easy task. The sheer amount of data lead to second problem: system is more prone to ‘signal error’ and ‘confirmation bias’. Signal error is when large gaps of data have been overlooked by analysts. Confirmation bias is the phenomenon that people will search within the data to confirm their own preexisting viewpoint, and disregard the data that goes against their previously held position<sup>37</sup>. Because of our enhanced technology, global interconnectivity, and huge data sizes our ability to create damage is greatly magnified when miscalculation is made. Another problem is that it is in fact ‘big data’ processing that enables behavioral-targeting and location-aware services for tracking consumer interests and activities mentioned before<sup>38</sup>.

34 Talia D. (2013). Clouds for Scalable Big Data Analytics. *Computer*, 46(5):98-101

35 Poursaberi A, Yanushkevich S, Gavrilova ML, Shmerko VP. (2013). Situational Awareness through Biometrics. *Computer*, 46(5):102-104

36 Pitt J, Bourazeri A, Nowak A, et al. (2013). Transforming Big Data into Collective Awareness. *Computer*, 46(6): 40-45

37 <http://www.wired.com/insights/2013/05/more-data-more-problems-is-big-data-always-right/>

38 Michael K, Miller W. (2013). Big Data:New Opportunities and New Challenges. *Computer*, 46(6): 22-24



Over the next decade, companies and government agencies will analyze an increasing amount of data to derive intelligence that can be used to streamline operations, make more informed decisions and detect anomalies that indicate a threat<sup>39</sup>. As the use of such 'big data' analytics spreads, attackers will have to find ways to hide from statistical analysis and anomaly detection. Information manipulation will likely be their strategy. By polluting data in certain ways, such as slowly creating a wider variance in some metrics, a knowledgeable attacker could modify an analysis platform's threat model and cause it to consider anomalous behavior as normal. Or, an attacker could create a lot of fake attacks, causing false alarms and wasting the time of human analysts. Attackers will also attempt to game 'big data' analysis systems in their favor. Google has already faced such attacks in the form of black hat search engine optimization (SEO). Other attacks could attempt to manipulate different aspects of the information economy, such as influencing the personalization algorithms used by many services. The designers of such analysis and correlation systems must account for attackers' efforts to poison data.

The security and privacy implications remains an open question, especially after disclosure of the National Security Agency's data-collection practice. It has revealed the extent to which data collection (NSA's PRISM program for gathering data on persons of interest) can be used to spy on people<sup>40</sup>. However, the program only scraped the surface of the data available for potential analysis.

## CONCLUSIONS

The rapid developments of modern technology have been changing dramatically our society. Emerging technologies such as cloud computing, 'big data' processing, Internet of Things (IoT) and situational awareness are modernizing us but they also arise a number of new security challenges. Among them ethical and juridical problems related to privacy issues are dominant.

Technology allows privacy to be compromised by: *invasion* - occurs anytime someone's private space is entered or viewed without permission; *profiling* - act of making assumptions or speculations about a person based on information that does not necessarily justify these assumptions; *identity theft* and *stalking* - the practice of tracking and gathering private information about a person. Much of the danger to privacy caused by new technology is not caused by better microphones and cameras. Instead it is caused by the ever increasing ability of computers to store and analyze data. In fact the privacy issue is emphasized in case of 'big data' analysis and information processing from distributed data sources (including social media) and large sensor networks. Companies collecting more information about consumers than ever before, are using them in order to target certain people with individualized advertisements and service (or the lack thereof). They create large databases of information about customers which are extremely profitable to sell. The fusion of social media data with biometric data and traditional surveillance techniques has allowed for the invasion of privacy in new and previously inconceivable ways.

All this issues must be properly addressed both from technical as well as juridical side. Only then citizens can be ensured that deploying emerging technology in modern society is at their benefit as well as companies and government.

## ACKNOWLEDGEMENTS

This paper is the result of the research on the project 'Structure and functioning of the police organization-transition, condition and perspectives', which is financed by the Academy of Criminalistic and Police Studies. The work was partly supported by a grant from the Ministry of Education and Science, Republic of Serbia [Project number TR34019].

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39 Byrne J, Marx G. (2011). Technological Innovations in Crime Prevention and Policing. A Review of the Research on Implementation and Impact. *Cahiers Politiestudies*, Jaargang 3(20): 17-40  
40 <http://www.theguardian.com/world/edward-snowden>

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## GENERAL ASPECTS OF DIGITAL FORENSICS OF MOBILE DEVICES

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**Abstract:** One of the crucial criminal scientific disciplines is digital forensics of mobile communication. Its aim is to collect digital evidences from mobile devices. It encompasses all devices whose range of possibilities includes ordinary voice communication, as well as communication of text messages. Forensics of mobile devices is used primarily in criminalistics, as well as for personal needs. This paper aims to discuss general approaches of mobile forensics and point out their most important characteristics.

**Keywords:** digital forensics, mobile devices, digital evidence.

### INTRODUCTION

With the growing trend of mobile devices, forensic evidence obtained from mobile devices can be a vital source of evidence for investigators. Data derived from a mobile device can be extracted and used to create reports on a range of data. For example, in a criminal investigation, data such as call history, message data, calendar events, photos and emails, can usually be obtained in a report format. In order to have data valid in a court of law, the given rules of forensic investigation have to be appreciated.

Although these forensic procedures differ from organization to organization, there are numerous frameworks to provide guidance for the conduct of digital forensics that form the basis of these procedures<sup>1</sup>. These frameworks have been published (Kent K, Chevalier S, Grance T & Dang H (2006), McKemish R (2008), Martini B & Choo K (2012)), as have mobile forensic procedures and tools (Me G & Rossi M (2008), Owen P & Thomas P (2011), Savoldi A & Gubian P (2008)). This has resulted in decisions in the development of forensic procedures and in specific cases using specific tools.

One of the most important strategic challenges posed to users of digital forensic, especially in the field of law enforcement, is to keep up in an environment of the fast evolution of information and communications technologies, and its immediate implementation of both the public and offenders (Adams CW (2008), Choo K (2011)). Smart mobile devices, for example, are much more complex than traditional mobile phones and with a range of personal data management facilities, these mobile devices more resemble personal computers than they do phones (Lim N & Khoo A (2009), Quick D & Choo K forthcoming). This is why they lend themselves readily for analysis since these contain a great quantity of data giving useful insight to a forensic investigator. However, the method of collecting evidence differs significantly as opposed to traditional forensic computer hard disk (Jansen WA, Delaitre A & Moenner L (2008)).

### FUNDAMENTALS OF MOBILE DEVICE TECHNOLOGY

Mobile devices are simple computers with a CPU, memory, batteries, input interfaces such as a keypad or mouthpiece, and output interfaces such as a screen or earpiece. Data in memory are generally the focus of a forensic examination, but some understanding of the input and output components is needed to access these data. In some instances, it may be sufficient manually to operate a device and read information from the display. However, in order to recover data that has been erased or carry out a more thorough examination, one needs tools designed especially for this purpose to be able to interface with the device. Occasionally, the acquisition of certain information of interest from a mobile device via a cable connected to the data port, but in other

<sup>1</sup> Australian Government, Australian Institute of Criminology, Mobile device forensics: A snapshot

circumstances it is necessary to attach a specialized connector directly to the circuit board in order to obtain the relevant information to a case. Often one needs to have specific knowledge of the way data are manipulated and stored on handheld devices in order to obtain all available digital evidence from handheld devices without changing it and translate it into a human readable form. For instance, if you place a mobile device on a cradle and synchronize it with a computer to obtain information from the device will not copy all data and may even destroy digital evidence.

Mobile devices operate using radio waves to communicate over networks with different frequencies and standard communication protocols. Two of the most common mobile communication protocols are GSM (Global System for Mobile Communications) and CDMA (Code Division Multiple Access). Apart from these, the most often implemented technology in the United States and various other states is iDEN.

Mobile devices feature various identifiers, depending on the manufacturer, region, and technology. A unique number is given to GSM devices called the International Mobile Equipment Identity (IMEI), which contains a serial number for the device. On CDMA phones, the ESN (Electronic Serial Number) is an 11-digit number with the first three digits designating the manufacturer and the remainder unique to the device. The MEID is beginning to replace the ESN, which is the CDMA equivalent of the IMEI. Moreover, some manufacturers assign their own unique serial numbers to mobile devices they make, and Bluetooth-enabled devices also have a unique hardware (MAC) address.

## SIM CARDS

GSM devices use SIM (Subscriber Identification Module) cards to authenticate with the network and store various information, including some user-generated activities. SIM cards comply with a standard regarding the type of information is stored where on the card. Though, SIM cards come in slightly different shapes and sizes. This results in the fact that a SIM card reader may not be able to accommodate or read data from all SIM cards.

The following constituents make up the SIM cards: a microprocessor, ROM and RAM. These are designated a unique Integrated Circuit Card Identifier (ICC-ID). The ICC-ID contains the mobile country code (MCC), mobile network code (MNC), and a serial number of the card. These smart cards are used to authenticate users on GSM and UMTS networks. Information on the network and user is included in the SIM card, as well as an authentication key necessary for establishing a connection with the network, the subscriber's personal identification number (PIN) for limiting use of the SIM, and the subscriber's phone number, which is called the Mobile Subscriber ISDN (MSISDN).

The SIM also contains an International Mobile Subscriber Identity (IMSI) that is uniquely associated with the subscriber and is comprised of a country code, a mobile network code, and subscriber identification number. A SIM card may also contain a Temporary Mobile Subscriber Identity (TMSI) and Location Area Identity (LAI). Frequently the TMSI is applied over the radio link to avoid revealing the IMSI number to others who want to intercept this information using radio-related interception equipment. The TMSI and LAI generally change each time a device moves to a new location area within the mobile network.

Some of the information stored on a SIM card is not known or cannot be easily accessed by the subscriber. It is interesting to note that there is considerable separation between the mobile device and the SIM card: thus it becomes easy to transfer a SIM card to another mobile device.

The SIM card stores the following main data:

User-related data:

Subscriber unique identifier (IMSI)

User telephone number (MSISDN)

Mobile identifier (IMEI)

Secret codes:

PIN code: subscriber authentication to the mobile

PUK (PIN Unlocked Key) code

Secret keys:

Symmetric keys in use for two distinct purposes:  
 SIM card authentication to the network  
 Communication ciphering

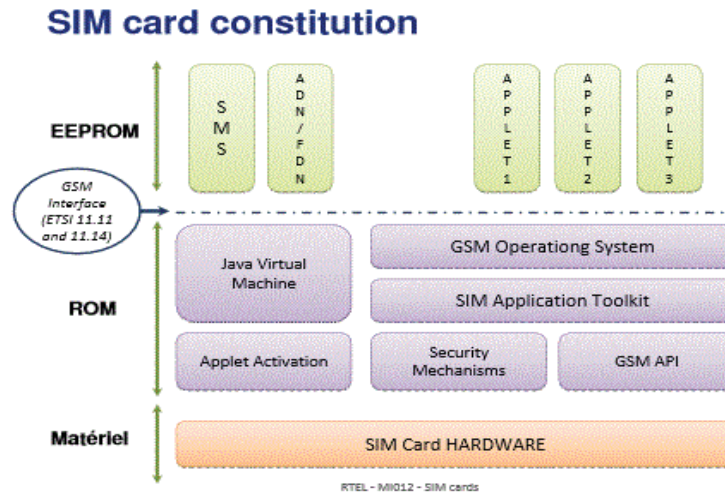


Figure 1. SIM card constitution

### TYPES OF EVIDENCE ON MOBILE DEVICES

The forensic benefit of mobile devices in an investigation may vary since it depends on the type of criminal activity which is under investigation, the capability of the mobile device, and the form it has been used. There are numerous locations where data associated with mobile phones can be found: embedded memory, attached removable memory, and the SIM card. Not all of these components will be available or necessary for all investigations, but on certain occasions there may be multiple SIM cards, removable media, or even more than one mobile device.

Because not all phones are manufactured in the same manner the type of information that can be extracted from a device depends on its capabilities. At a minimum, mobile phones can be expected to contain address books, call registers, and Short Messaging Service (SMS) messages, also called text messages.

The advantage of text messages is that they offer full transcripts, unlike call records, and date-time stamps of received SMS messages are usually exact because they are inserted by systems operated by the network service provider rather than by the mobile device itself. Still, messages do have investigative drawbacks: the time of reading of the text messages is not recorded, and messages may not be complete as the owner may have deleted them from the device. Some acquisition methods may recover deleted messages, but this depends on the method of extraction.

Photographs, audio, and video can provide some of the most compelling digital evidence in a case.

Smart phones have Internet capability which are equal to those of numerous computers. A more advanced smart phone will additionally store an Internet history, Internet cache, Internet bookmarks, MMS, e-mail, photographs, videos, and installed third-party applications and may be used for transferring computer files. Email and Internet browser history and bookmarks may offer significant forensic insight, and phones present yet another source of this data. There is also a great amount of information in third-party installed applications. While online application marketplaces have been in existence for several years, they have come to playing crucial part of the user experience in mobile devices and significantly augment the capability of individual mobile phones.

## HANDLING MOBILE DEVICES AS SOURCES OF EVIDENCE

Generally speaking, forensic principles applied with mobile devices are no different from those with any computing devices in order to enable others to authenticate acquired digital evidence. It must be remembered that the aim of a forensically sound process is to document that the evidence is as claimed and has not been modified or replaced in the process of collection. At least, all steps taken to extract data should be recorded to support transparency and repeatability, enabling others to assess and repeat your work. In addition, the MD5 hash of acquired data should be calculated and documented, allowing others to verify that nothing has been altered since the data were acquired. The procedure principles state that all issues that took place while the data acquisition was under way are to be noted, even when they are embarrassing or the cause is unknown. Continuous possession and control has to be proven through documentation throughout its lifetime. Therefore, it is necessary not only to record details about the collection process, but also every time it is transported or transferred and who was responsible.

It must be remembered that certain devices are able to receive data through wireless networks likely to provide new evidence but are in danger of overwriting existing data. Thus, it is the task of the investigator to decide regarding the allowing or disallowing of the device receiving new data over wireless networks, which is presented in Figure 2. If one removes the battery from a mobile device, they will prevent it from communicating but may also activate security measures such as lock codes and encryption that could prevent further access to data on the device. Moreover, one has to isolate the mobile device from the network they use an acquisition methods requiring that the mobile device be powered on.

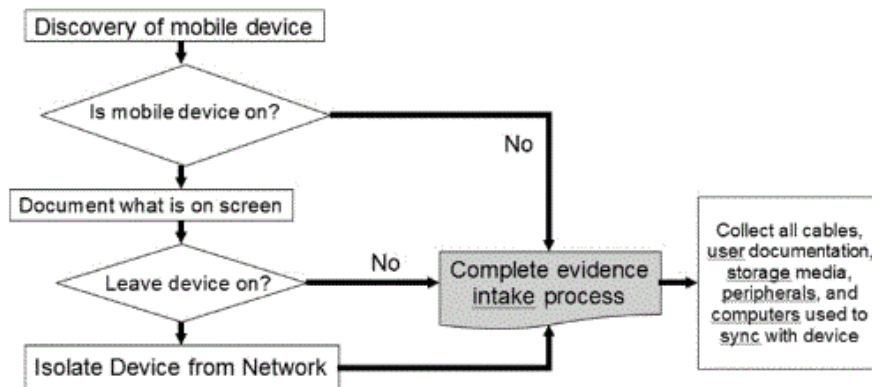


Figure 2. Flowchart of handling mobile devices <sup>2</sup>

If the mobile device is isolated from the network, this means that the contents of a phone reflect the time at which it was seized, disallowing changes that may occur to it after it has been seized. Actions over the network that can modify content include receiving phone calls, messages, network polling activity, and the use of remote erasure systems; the latter being an enterprise feature designed for corporate smart phones. It is possible that such network activities may modify the contents of a mobile device, possibly adding new data, overwriting existing data or unallocated space, or erasing the phone contents remotely.

It is possible to reconfigure some devices in order to prevent communication with the network. Faraday isolation may be applied with devices that do not have such a feature to isolate them from radio waves, such as radio-frequency shielded evidence containers, which block network communications. Signal jamming systems provide another means for preventing mobile devices from communicating with a network but this type of equipment is illegal in some jurisdictions.

It is important to maintain network isolation practices throughout forensic analysis, and this is achieved with shielded mobile phone examination rooms or extraction cases. The device can

2 E. Casey & B. Turnbull, Digital Evidence on Mobile Devices, Chapter 20, Elsevierdirect

be protected the device against damage or accidental activation by packaging it in an envelope or bag.

Following precautionary measures to ensure the protection of the device, it has to be examined for physical damage or suspicious modifications. In most cases, a cursory examination of the exterior of the device will suffice. Nonetheless, if one is faced with a highly-skilled techie or a dangerous offender, X-ray or high-resolution microscopes can be implemented in order to detect physical damage or modifications.

As memory modules are becoming ever smaller in size, it is also easy to overlook, hide, destroy, or swallow them. The microSD card can store 256 MB of data, and much larger capacity cards are emerging. These storage modules can contain multimedia files, SMS/MMS messages, as well as backups of data from the mobile device.

These storage media are generally FAT formatted and the same manner of handling applies to them as to other storage media. It is especially important to document the serial number and any other identifying details further, to determine if the media has been damaged, activate write protection switches if present, and make sure that a forensic duplicate of the contents is created by using a suitable adapter. The resulting forensic duplicate can be examined using your forensic software of choice, enabling exploration of the file system and recovery of deleted files.

In addition to collecting a mobile device itself, it is important to look for associated items that might contain data or help extract data from the device. Removable memory and SIM cards can contain more data than the device itself and interface cables and cradles may be needed to connect the device to an evidence collection system. Similarly to other computers, one has to document the types of hardware and their serial numbers, taking photographs and notes if applicable. At the time of seizure, if a device is on, it is advisable to keep it turned on, since there is a danger of activating a password protection when turning it off, and thereby it becomes more difficult to obtain data from the device later. Also, document any information visible on the display including the date and time of the system clock.

### FORENSIC PRESERVATION OF MOBILE DEVICES

Considering the wide range of mobile devices, it is to be expected that there is no single, standardized method to access all forms of devices in order to obtain data using software or hardware. This is one of the first major hurdles of mobile device forensics, because without any means of accessing the data on a device, you are left with only one option: manual examination. During the acquisition of data from mobile devices, the case at hand will most likely dictate the range of options applicable in order to extract the data. This, on the other hand, means that no single tool will cover all mobile devices nor will a single tool cover all situations. The table below shows the currently available methods applied in the data acquisition process from mobile devices.

Method	Description
Manual operation via user interface	<p>Examiner manually accesses the phone through the user interface. To ensure that all details are documented and the chain of custody is preserved, this process is normally photographed or videotaped.</p> <p>Only data accessible through the operating system is retrievable. The most basic process.</p>

Logical acquisition via communication port	Logical acquisition methods interact with mobile devices using protocols such as AT commands and OBEX (OBject Exchange), and only extracts data that is accessible through the operating system.
Physical acquisition via communication port or proprietary interface	Extracts the memory contents in their entirety through the communications port. Interpreting the extracted binary is dependent on understanding how the phone stores data in memory structures.
Physical acquisition via JTAG (Joint Action Test Group)	Uses the JTAG interface to extract the memory contents of the device. Allows the extraction of full binaries. Acquiring digital evidence via the JTAG is less intrusive than relying on the device operating system, but interpreting the extracted binary requires in-depth knowledge of the device.
Physical acquisition via direct memory chip access	The most low-level and potentially complex acquisition method for mobile devices. Involves extracting memory chips from the device and reading the memory structures. Can provide access to all device content, but requires knowledge of interpreting the raw structures. This technique should not be used for cases when the original device must remain operable.

*Table 1. Methods of extracting information from mobile devices<sup>3</sup>*

Forensic investigators are advised to implement at least two or more of the methods in Table 1. during data acquisition for results to be compared to ensure the information that you are basing your work on is correct.

Occasionally it is sufficient to perform a manual examination if only particular information is needed from the device. Prior to the manual examination of a device, investigators are advised to become familiar with its operation using an identical test device. This is why forensic laboratories that specialize in this type of examination maintain an extensive collection of mobile devices, as well as to enable tool testing and tool development.,. While the manual examination is being performed, the important issue it to record every actions that the device was subjected to, so as to enable others to assess whether the examination was performed satisfactorily.

The most common automated method of accessing devices is using a data cable, followed by a wireless means such as Bluetooth. Once you have such access to the device, the next major hurdle is determining the most effective means of extracting data from the device. Certain mobile devices support standard AT command access, but the drawback is that it will only provide access to a limited selection of data. A number of mobile devices have proprietary

<sup>3</sup> E. Casey & B. Turnbull, Digital Evidence on Mobile Devices, Chapter 20, Elsevierdirect



protocols and require manufacturer/developer tools to execute. Logical acquisition provides context for items such as date-time stamps and location within the file system on a mobile device. In given situations what can be retrieved from a data cable may differ significantly from the information that can be extracted via Bluetooth, so there is advantage in performing logical extraction in different ways to ensure all possible content has been extracted.

### **MOBILE DEVICE FORENSIC TOOLS**

Forensic tools are continuously developing to ensure suitable tools for specific data extraction from various mobile devices, typically logically via cable, infrared, and Bluetooth or physically via cable or JTAG. All of these tools function in a similar way, sending commands to the phone and recording responses that contain information stored in the phone's memory. The information that can be extracted using these methods depends on both the connection mechanism and model of the phone.

Logical mobile phone acquisition systems interact with the phone operating system to extract data, similarly to the vendor synchronization systems. In this case, the retrievable information is limited, and only information relevant to the Operating System is available. This was, forensic investigation might miss potentially relevant information; for example, information such as deleted items will remain unextracted. Mobile phones generally have a baseline of extractable data from such tools; phone address book, call register, SMS and photographs, but additional information is not guaranteed.

### **FORENSIC EXAMINATION AND ANALYSIS OF MOBILE DEVICES**

The aim of performing a forensic examination is to locate and obtain information associated with an investigation, including deleted data. Irrespective of how the mobile device was acquired, be it logically or physically, the general examination approach no different<sup>4</sup>.

- the available items have to be surveyed to become familiar with the main sources of information on the mobile device.
- any deleted items are to be recovered including files, SMS messages, call logs, and multimedia.
- metadata has to be harvested from active and recovered items such as date-time stamps, file names, and whether messages were read and calls were incoming, outgoing, or missed.
- a search and methodical inspection of the evidence is to be conducted, including keyword searches for any specific, known details related to the investigation.
- temporal and relational analysis has to be performed of information extracted from memory, including a timeline of events and link chart.
- important results are to be validated because even forensic tools have bugs.

In the case of active data on a baseline mobile device, the examination of all the acquired messages, call logs, calendar entries, and other items stored on the device may be possible. However, when the complete file system or a full physical memory dump was acquired from a mobile device, it is generally infeasible to examine every file or data fragment stored on the device. In such cases, digital investigators must develop a strategy to find relevant digital evidence. Surveying the acquired data by looking through folders and viewing the contents of files on a mobile device can lead to some useful items and may help with the development of a strategy, but this process is not a substitute for a methodical forensic examination. One of the issues that a solid forensic examination strategy has to take into account is what exactly the investigators know about the crime and the types of information that are being sought. For instance, if the case points to a specific time period of interest, it may be effective to examine all activities on the mobile device and reconstructing a timeline of events may be an effective strategy. In a different example, when the case involves digital photographs, it may prove advantageous to employ a combination of file system examination, keyword searching, and file carving so as to locate all relevant items on a mobile device.

<sup>4</sup> E. Casey & B. Turnbull, *Digital Evidence on Mobile Devices*, Chapter 20, Elsevierdirect

## CONCLUSION

Apart from the issues of forensic examination purity, the task of forensic examiners is to deal with technical problems, starting with identifying the manufacturer and operating system of the specific phone. The real challenge is posed by the wide range of modern phones. With the choice of software for investigations, investigators have to be both fully aware of what data is available and not available for extraction from a device in principle, as well as the amount of retrievable and processable data by the specific software.

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## ENHANCING THE POLICE INTERROGATION SKILLS USING COMPUTER SIMULATIONS OF THE SUSPECTS' BEHAVIOR<sup>1</sup>

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**Abstract:** The ability to get and distinguish truthful from deceptive statements becomes a prerequisite for any (crime) investigation that tends to be successful. Despite this police officers' accuracy rates in detecting deception is at the chance level. If we bear in mind the importance of the suspect's statement in resolving crimes, learning and practicing the interrogation skills must take the prominent place in every police organization. In many police interrogation training curriculums officers rarely do little more than listen or read how to detect deception, how to build rapport, what tactical approach should be used in different situations etc. Because of that, their knowledge is usually abstract and less applicable. Having this in mind, the authors explain the advantages of a new and innovative way of interrogation training - computer simulations technology. They present two different computer simulations of suspect's behavior, one that uses computer-generated simulations of humans (avatars) and the other that uses computer-controlled videos of real actors. At the end, the authors made a conclusion that the advantages of using computer simulations in interrogation training must be recognized, evaluated and implemented in police (training) practice in the Republic of Serbia.

**Keywords:** police, interrogation, suspect's statement, detecting deception, computer simulations.

### INTRODUCTION

Under the influence of popular "police" TV series<sup>2</sup>, there is common impression in public that whenever crime is committed, careful examination of the crime scene will not only enable identification of the offender, but it will prove his guilt. Unfortunately, despite the significant development of technology and its implementation in the field of policing, crime scene investigations are not yet at the level that will allow finding enough physical evidences for a conviction in each and every crime scene. In the cases where physical evidence is inconclusive or lacking the statements of the persons connected, directly or indirectly, to crime are the starting points. Hence, the ability to get and distinguish truthful from deceptive statements, becomes a prerequisite for any (crime) investigation that tends to be successful.

In this regard, the suspect's statement is of the particular importance because, assuming he is the actual offender, he knows best how crime happened. Having this in mind, it is clear that such statement could be more detailed than the statements of any other persons involved in particular crime. The suspect can point to a place where it is possible to find and collect certain objects and leads which may become (following certain legal procedure) evidence. His statement is of the great importance when it comes to checking possible explanation of the way crime is committed and unraveling various facts and circumstances which should confirm or deny the possibility of suspects' involvement in crime. In addition, suspect's statement can greatly influence the way,

<sup>1</sup> This paper is the result of the realization 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 Criminalistics and Police Studies in Belgrade (2011–2014). The leader of the Project is Associate Professor Saša Mijalković, PhD.

<sup>2</sup> For example, one of the most popular is *CSI: Crime Scene Investigation* (also known as *CSI* or *CSI: Las Vegas*), a crime drama about forensic investigators who use high-tech science to follow the evidence and solve crime. It has two spin-offs (*CSI: New York*, *CSI: Miami*) that are equally popular worldwide.

the place and the time other investigative actions should be conducted (e.g. executing a search warrant). Also suspect's statement can point to some other persons, who may appear at the court as a witness, experts etc.

The main obstacle crime investigators face during the suspects' interrogation is their reluctance (resistance) of telling about things that could lead to his indictment and conviction. Such a reaction is expected, usual and ultimately natural reaction inherent to every human being who finds himself in such a situation. Therefore, the main task of crime investigator during the interrogation is to suppress such resistance and obtain necessary information (confession), in a way that is in accordance with law (e.g. without use of coercion, threats, trickery etc.).

Today, a number of police investigators, not only in the Republic of Serbia but all over the world, who conduct interrogations on a daily basis, do not have adopted planned, methodical approach that will break the resistance of the suspect and obtain his confession (assuming that the suspect is the actual offender). Also they do not have enough knowledge about what are the cues of deception and how to discern truthful from deceptive statement. Instead improvisation depicts the way they interrogate. Although sometimes necessary, improvisation must not become a style of work, bearing in mind the importance of the suspect's interrogation (Milić, 2006:74). Usually improvisation is an obvious sign of the lack of training or the proof that it is not carried out in a way it should. Having in mind the importance of possessing and improving the interrogation skills, the authors explain the advantages of one of the most recent methods of learning and practicing interrogation skills - one that assumes the use of computer simulation of the suspect's behaviors.

## DETECTING DECEIT DURING POLICE INTERROGATIONS

During interrogation the suspect will try to hide his participation in a criminal incident. However, no matter how he tries to hide his guilt, faced with the fear of possible criminal prosecution and punishment, his behavior is unconsciously changed so verbal communication is complemented by non-verbal behavior. Therefore, crime investigator who pays his attention exclusively on the content of suspect's verbal statement, while not paying attention to the way he speaks (rate, pitch, volume, speech hesitation, response length, etc.), as well as body movements that accompany his statement (kinesics), will not be successful during the interrogation.

However, the research results show that ability of people to detect deceit is very limited and that the police, like other professions in which lie detection capabilities are needed (e.g. customs officers), are equally effective in lie detection as ordinary citizens - the probability with which police and customs officers detect a lie does not differ significantly from a chance (probability ranges from 45 - 60 %) (Vrij, 2002:74).

According to Colwell et al., it is possible that detecting deception in others is such a difficult task that humans can never achieve high rates of accuracy (Colwell et al., 2006:277). However, this pessimistic view overlooks the rather impressive performance of some individuals, notably professionals, in some studies. Vrij and his colleagues have reported accuracy rates that do exceed chance levels, with some police officers being able to detect deception with as high as 80% or 90% accuracy (as cited in Colwell et. al., 2006: 276). According to Ekman and O'Sullivan, even more impressively, members of the US Secret Service demonstrated extremely high levels of accuracy, with more than half (53%) achieving accuracy rates of 70% to 100% (as cited in Colwell et. al., 2006: 276). Thus, it appears that some individuals are quite capable of detecting deception in others (Colwell et al., 2006:277).

One possible reason for the poor performance of law enforcement officers may be due to the cues that they rely on when judging someone as truthful or deceptive. Many researchers have found that laypersons as well as law enforcement officers tend to rely on cues that recent meta-analyses have found do not relate to deception, so these low-accuracy rates are not surprising (Reinhard et al., 2012:823). In this regard, we should distinguish "subjective" cues (those that people expect to notice when someone lies) and "objective" cues (scientifically determined to be more likely to appear while someone not telling the truth). According to Akehurst et al., the stereotype of a liar typically includes behaviour such as gaze aversion, nervousness, and an increase in leg and hand movements, as well as less logically consistent statements with more spontaneous corrections and fewer relevant details (Akehurst et al., 1996). In the Republic of

Serbia, Valentina Baić conducted research on a group of the students of the Academy of Criminalistics and Police Studies in order to see what kind of nonverbal behavior is indicative of lying and whether it is “subjective” or “objective”. She concluded that students’ lie detection capabilities are based on the nonverbal behaviors “that are not considered as consistent indicators of deception and are part of the stereotypical beliefs about their relationship with lying” (Baić, 2011:28).

Detecting deceit is not an easy task for both laypersons and experts, because they hold erroneous beliefs about indicators of deception. When provided with useful, “objective” information regarding deception they can improve their abilities to detect deception which is proved by numerous studies (Colwell et al., 2006:276). Hence, crime investigator must be well educated and trained, not only to notice the signs of deception but to interpret them correctly. For example, Porter, Woodworth and Birt noted a significant increase in judging the accuracy of videotaped statements after completing a 2-day workshop over a 5-week period of the Canadian federal parole officers. This training package, which included an overview of the research on deception and interviewing (including debunking many popular myths), practice sessions, specific feedback, and a “refresher course” 5 weeks later, improved officers’ baseline accuracy rates of 40% (significantly less than chance) to an impressive 77% (significantly greater than chance). The officers who received all elements of the training (information, practice, and feedback) outperformed those who received only one or no elements of the training program (as cited in Colwell et. al., 2006: 276).

Despite those findings, as it is noted above, the majority of officers detect a lie with a success rate that does not differ significantly from a chance. At the same time, we should have in mind that although most law enforcement officers receive specific training in deception detection, their accuracy rates remain at the chance level. How to explain this? According to Colwell et al. (2006:277) it is possible that law enforcement officers (excepting the Secret Service), like most people, simply are poor lie detectors. However, it is also possible that the officers’ training is not successful in enhancing their knowledge in accurate lie detection. So, how can someone be effectively trained to interrogate suspect?

## **POLICE INTERROGATION TRAINING METHODS**

Resolving crime cases demand various knowledge and skills and the ability to distinguish truthful from deceptive statements is one of the most important, especially in cases in which physical evidence is inconclusive or lacking. Therefore, training police officers to evaluate accurately the statements and the behaviors of suspects (not only them, but witnesses, and victims too), must have a prominent place in every police organization. This can be done using different training methods. The most common are:

### **1) Lecturing and reading materials on subject**

Lecture is one of the most frequently used teaching methods that can be used alone or as a supplement to other methods. It is an oral presentation intended to provide information about a particular subject. If it is dominated by excessive theoretical knowledge without clear real-world application, students are placed in passive role which hinders learning.

In many cases the starting point of any interrogation skills learning is reading materials (books, manuals, etc.) that aim to provide police officers (both prospective ones and those who are already in service) knowledge needed to gain skills in interrogation tactics, building rapport, basic understanding of the behavioral cues that do (and do not) betray deception etc. Those materials are often presented in classes during police training (basic or specialized) and/or education processes, but they are available in libraries, book stores and Internet, so everyone can obtain them on their own.

Unlike Western countries, primarily the USA, where dozens of books dealing with the police interrogation and interview exists, in Serbia there are only a few. As a result, the majority of those who works in Serbian police and do not speak English, have pretty low opportunity to



learn and enhance interrogation or interview skills. Furthermore, contents related to the interrogation and interview skills almost not exist in Serbian police training and education system<sup>3</sup>.

## 2) Introspection

In order to learn how to “read” people successfully, one must, to the extent it is possible, meet himself. Contemplation of one’s own thoughts, feelings, and sensations is called introspection. As Heren (1977:64) highlights: “I have to know my personal scale of sense, the structure of prejudice, basics of my responses and tolerance limits. I have to try to figure out if I’m really what I think I am, or through the eyes of those who surround me, I am someone quite different. In other words, we must determine what are the sweet illusion that I was deceiving myself ... “

## 2) Observations

Crime investigator must strive to meet as many types of people as it is possible, their customs, habits, attitudes, prejudices, their mentality and different ways of life. There are several ways in which this can be achieved, but one of the easiest is to look at people (on the street, at public transport, etc...). Each contact, conversation, movement of persons may be subject of analysis and conclusions that are made should be compared with the prior experience.

Reading materials on subject, observing people and introspection, should be a “long life learning methods” crime investigators should apply on their own. Although important, they must not be the only methods. Knowledge gained by this means is the basis that should be upgraded both in classroom settings (e.g. at training seminars, courses) and in the field. This can be achieved best by the use of the following methods:

### A) The role plays

The role play is one of the active learning methods. The essence of this learning method is reflected in the fact that one student assume the role of a suspect and another the role of interrogation officer<sup>4</sup>, while the rest of students should carefully observe interactions between the roles, noting things they consider important (e.g. mistakes of their colleagues, advantages or disadvantages of the used approach etc.). Finally, the debrief is conducted during which students are required to actively participate in the discussion.

Some of the advantages of this kind of learning are: the “real world” is simulated, students are active, emotions are felt, students have the opportunity to see things from different perspectives (police officer, suspect, observer) etc. On the other hand, the main weakness of this kind of learning is that there is a strong possibility that the game could be turned into a “theater” and the students instead of being focused on learning, they get a chance to have a fun. To prevent this, it is essential that the instructor have control over the role play at all the time of its duration, and it is recommended that the group is not larger than 15 participants.

The role playing, along with case studies, are the most widely used method in contemporary interview/interrogation training curriculums. The great learning outcome can be achieved in the cases where instead of students, role of suspects is taken by actors. In this sense, it is desirable to establish cooperation with the acting schools (colleges), and engage senior students, or even better, real actors. This type of cooperation is not only desirable for learning and practicing the interview and interrogation skills, but other police tasks (search and seizures, arresting, dealing with public riots, domestic violence etc.) too.

### B) Analysis and discussion of real criminal cases (case studies)

<sup>3</sup> In The Republic of Serbia, there is only one police education faculty - The *Academy of criminalistics and police studies* - which carries out: undergraduate studies (bachelor 4-year studies and basic professional (vocational) 3-year studies of criminalistics) and graduate studies (master and specialist studies of criminalistics). Academy offers only one course regarding police interrogation and interview skills during its 3-year education program (*Tactics of providing statements*). Its 4-year educational program (bachelor degree) does not offer any course. And that is not case in other subjects, because few of them are covering theme of police questioning or interrogation of suspects, but partially (such as Criminalistics relates subjects, both in graduate and undergraduate studies).

<sup>4</sup> Except the roles of interrogator and suspect, in some training scenarios more students can be engaged assuming the roles of public prosecutor and lawyer.

Another way of learning and practicing the interrogation skills is to analyze documents regarding real criminal cases (criminal charges, interview/interrogation records, interrogations videos and other, both formal and informal, documents used in the pre-trial and court proceedings) and require students to make a suspect profile, to determine his motives, defense tactics that are used during interrogation process, the way the interrogator obtained the confession etc.<sup>5</sup> In such learning process video recordings are particularly useful - their significance is best proved by the fact that experienced police investigators, after completion of the interrogation process, often use its video recording in order to once again go through some critical points reviewing decisions they made, noting mistakes etc.

### C) Mentoring

It is difficult to practice applying interrogation skills (and gain necessary experience) before attempting to use them in (real) investigative work. One of the most appropriate ways to make transition from learning environment into the interrogation room is on-the-job training, under the supervision of seasoned interrogator (mentor). The greatest effects will be achieved if the inexperienced investigator attend interrogation process conducted by (or in presence of) his mentor.

Knowing what kind of negative effects may cause the presence of a third person on a suspect and his readiness to confess, experienced investigators may be reluctant to conduct suspect interrogation in the presence of audience<sup>6</sup>. The second drawback of this (mentor) approach is that it essentially limits the learning process to the individual experiences of those senior officers and whatever techniques they deemed worthy. In order to avoid that some inexperienced officers should be exposed to multiple mentors who practice different approaches, strategies etc.

## SOME REMARKS ON THE QUALITY OF THE INTERROGATION TRAINING

Police officers all over the world have some kind of training regarding the interview and interrogation skills. So how to explain the fact that their accuracy rates in detecting deception is at the chance level. By the fact that they do not receive enough training? Or the training is not successful in enhancing their skill and knowledge? Or both?

Learning interrogation skills (including detection of deception) cannot be one-time activity. It is rather long life learning process that happens both during the service, and outside it, in real life situations. Hence the police organizations where officers receive this kind of training only once, during Academy, denigrate all the complexity interrogations carries itself. Police organization in the Republic of Serbia is such example.

From the aspect of this paper, it is much more important the second issue - the quality of training. In many police training concepts officers rarely do little more than listen or read how to detect deception, how to build rapport, and what tactical approach should be used in different situations etc., but they have little or no opportunity to apply and practice what they have learned. Hence their knowledge becomes "abstract" and "theoretical" and less applicable. Although inevitable lecturing should not be the sole or predominant way of training, what is needed is active learning - students must do more than just listen. They should do things and think about the things they are doing. They must be engaged in solving realistic problems. They should be left to make choices and learn from the outcomes of their choices in a safe environment.

At the same time we should be aware that the best way to practice interrogation skills is hands-on interrogation with known suspects. Although learning and practicing interrogation skills using actors may be acceptable substitute for real life interrogations, usually it is not affordable for many police organizations and not always so realistic. Having in mind the impor-

<sup>5</sup> According to article 236 sec. 10. of Serbian Criminal procedure code, it is allowed to use recorded material from legally finished cases in scientific and practical matters.

<sup>6</sup> Usually avoidance of other persons is not possible due to legal reasons - attendance of lawyer or public prosecutors is needed.



tance of learning and practicing interrogation skills especially with time and budget constraints, new and innovative way of training was needed. The solution was found inside the Army - computer simulations technology.

### COMPUTER SIMULATIONS TECHNOLOGY

Computer simulations technology was devised in order to give trainees the visual, auditory and sometimes physical experiences of the real life situations which could substantially enhance the learning process. Simulation technology once was associated almost solely with military training - in flight and on the battlefield - where the high price of development could be justified by curtailing the safety risks and expensive equipment associated with real-world training (Friel, 2003). With the fall of the costs of developing simulation technology, it started to be used by government agencies.

Computer-based simulations of interview and interrogations are great tools for gaining, retaining and refreshing interrogation skills. Simulation technology allows conducting an interrogation without a real live person in the room, but with a simulated suspect on a personal computer, using interactive, multimedia software<sup>7</sup>. The main advantages of computer based interview/interrogation simulation are stated below.

- It is engaging and user-friendly technology that uses virtual characters. Characters can be either computer-generated simulations of humans (avatars), or computer-controlled videos of real actors (Figure 1). Training with a video of a human character is more effective than training with a computer-generated character because of the realistic nature of the interaction.



Figure 1. Computer generated human - avatar (left) and real actor (right)

- It is cheaper than mounting real-world training exercises. Although development costs at the beginning can be significant, they are paid off quickly.

- It can be distributed on DVDs or via the Web, eliminating the need for costly travel and classroom space. It allows officers to train and practice interviewing techniques both at work and at home settings at any time. It can be used during interrogation classes and as a standalone practice drill to enhance the interviewing skills of seasoned officers. The only thing that is needed is computer.

- It allows the learner to make mistakes and learn from them in a safe environment.

- Rewinding and repeating conversations are not possible with real interrogations, but computer simulations allow reproducing any part of it multiple times, thus allowing reviewing decision that have been made at some (critical) points of the interrogation process.

- Computer simulations often entails scoring system which enables not only the assessment of someone achievements (feedback), but by encouraging competition between learners, it could enhance learning (learning to improve score, not just to pass the lesson).

In the following part of this paper, two interrogation simulations solutions will be presented - one that uses computer controlled videos of real actors developed by *SIMMersion LLC.*, and the other solution that is based on computer generated characters, developed by *Concurrent Technologies Corporation.*

<sup>7</sup> Except practicing interrogation and interview skills, nowadays law enforcement agencies use computer simulations for driver training, using firearms, use of force decision training, taking witness statements and complaints, for disaster response training, domestic dispute interventions, hostage negotiations, courtroom testimony training etc.

### HANDS-ON INVESTIGATIVE INTERVIEW TRAINING SYSTEM (HIITS)

Hands-on Investigative Interview Training System (HIITS) is developed by *SIMmerson LLC*. and allows talking to virtual suspect who is different and unpredictable in every conversation<sup>8</sup>. At the beginning the user is presented with training scenario. He has to interrogate Jennifer Lerner, a character portrayed by an actress (Figure 1 - right). She is suspected of stealing sensitive files from her workplace. User has to determine whether or not Jennifer took the files. If she is guilty, user must discover her motive and use it to solicit a confession<sup>9</sup>.

After reviewing the online training scenario, users start the interview by choosing one of many different conversation topics, including people Jennifer works with and her family, her opinions related to how the crime was carried out and who may have done it, the good and bad aspects of her working environment, the timeline of her activities the day the files were taken, rationalizations for taking the files, accusations and reasons to confess and obtaining and verifying a written confession. The goal of the trainee is to navigate the subject through different behavioral states and then determine if the subject is truthful or not<sup>10</sup>.

Questioning is conducted by selecting a question, user deems the most appropriate one, from an extensive list of questions available on-screen (Figure 2-C). Statements and questions are organized into topics (Figure 2-D). User can choose any topic at any time by clicking on the topic's name. doing so will bring up new statements or questions user can use in his conversation. Topic can be chosen in any order user deems appropriate. The character's response segments were videotaped and stored as part of the program. After the question is chosen, it is heard, followed by Jennifer's responses in the form of audio and video sequences. Audio and video sequences allow the user to observe both verbal and nonverbal behavior and to make decisions regarding Jennifer's honesty (Figure 2-A).

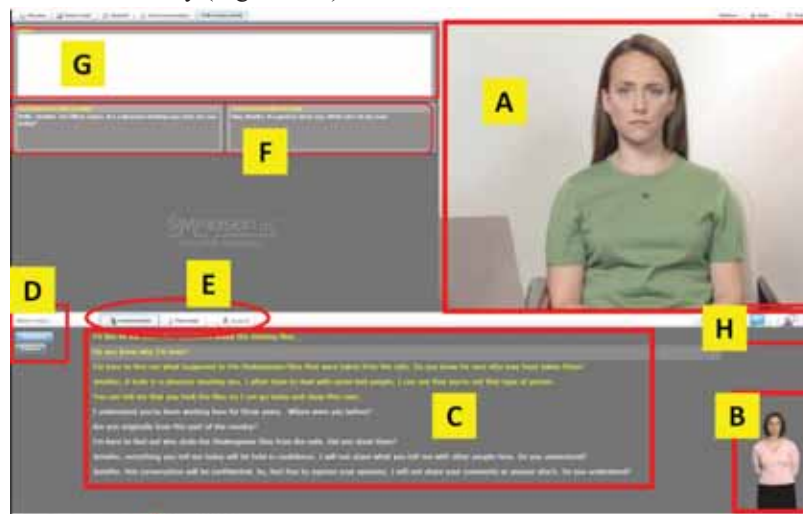


Figure 2. *SIMmerson* software's screenshot. Different letters denotes some software features and will be referred to through the paper:

8 In 1996, instructors who teach interviewing and interrogation at the FBI Academy met with members of the Johns Hopkins University's Applied Physics Laboratory (APL) to determine if they could create a computer program that would realistically simulate a human personality. The APL accepted the challenge and delivered the completed software to the FBI in May 1998. "Mike Simmen" (i.e., simulated man) was born (Einspahr, 2000:17). Software presented in this paper is considerably improved version from the Mike Simmen both in content and technology.

9 It may sound easy task, especially for those who work in the field for some time, but software developer warn "It will not be easy. Jennifer is much smarter than you think". Retrieved from [http://www.simmerson.com/character\\_interrogation.aspx](http://www.simmerson.com/character_interrogation.aspx).

10 Dale Olsen, the software developer, warns that Jennifer is a challenge and that the only way she will open up is if user spend a lot of time building rapport. Source: e-mail communication of the one of the authors with Mr. Olsen.

After response is given, additional follow up questions appear, while program eliminates those questions that users have asked or those that have lost their relevance. The last question or statement and suspect's reply are displayed on the screen (Figure 2-F). In order to achieve more realistic conversation voice recognition is added as another virtual reality component, allowing the interviewer to converse with the character in near real time<sup>11</sup>. As noted by Olsen (1997), there is, of course, a lack of spontaneity and realism in the simulated interview but student must somehow input or select the desired question while the simulated subject waits. However, the delay does give the trainee time to think and to develop better habits" (p.3). This is of significant importance especially in educational environment, because there is a space for evaluating and learning within pauses, so that can be better used in that environment than in real one.

Although our goal is to simulate a real interview, the possible questions and responses must be limited to those planned as the script was developed. What appears to be a serious limitation, however, is not as restrictive as it may seem. First, there is a limited set of standard questions that provide important diagnostic information. These questions are included in the script. Second, the script offers a reasonably rich variety of questions, giving the student the opportunity to practice question formulation. Third, even though the questions are limited, there will still be hundreds available, making it possible to provide paths representing many realistic interviews. Finally, responses will depend on how well the student has laid the foundation for the questions, making rapport development an essential part of the successful simulated interview (Olsen, 1997:3).

One of the most distinct features of this software is that Jennifer is different in each conversation, based on a combination of veracity, personality, motivations, and mood. Specially designed and patented logic system allows the character to provide a different conversational experience every time, even if the user attempts to say the same things in the same order each time. With an engaged user who tries to talk about different things as well, it becomes nearly impossible to have the same conversation twice<sup>12</sup>.

Each time the system is used to practice, the simulated subject provides different responses, sometimes indicating truthful behavior and at other times subtly indicating deception motivated either by revenge or financial need. What the character will say depends on: 1) Everything that has been discussed through the entire conversation; 2) The character's personality type, which is randomly selected by the computer before each conversation. Is the character generally friendly and forgiving or impatient and curt?; 3) The character's feelings towards the user, driven by how well the user has built rapport with the character; 4) What the character wants to talk about. He may have different goals or interests than the user. These factors are used to create probabilities for what the character will say, and then one of those responses is randomly selected from a list of appropriate responses<sup>13</sup>.

Any learning and practicing of interrogation skills must be followed up by adequate feedback in order to assess the decisions that are made. In police practice it is difficult to achieve this, because, as explained by Colwell et al. (2006) police officers may never find out that a suspect they labeled as deceptive was actually being truthful, as officers often receive no feedback on a case once it is referred for prosecution (p. 286). As it is noted by Vrij, it is not surprising that greater experience and more years in service do not result in superior accuracy in detecting deceit. (Vrij, 2002:74-82). Having this in mind, in a training environment, providing accurate feedback is of the most importance<sup>14</sup>.

The importance of the feedback is well recognized in HIITS. After finishing a simulated conversation, users receive a detailed assessment (feedback) that allows them to track their progress, identify their strengths and weaknesses, and receive suggestions for improvement. Users can also view a line-by-line evaluation of their conversation choices and replay the audio and video of their exchanges. Through the conversation user can make notes (Figure 2-G). User achievement is assessed by numeric score which can be used to track their improvement.

<sup>11</sup> Users can talk to the characters with a computer microphone. Their speech is recorded, allowing users to hear their own tone of voice when they review their conversations.

<sup>12</sup> More details can be found at <http://www.simmersion.com/peoplesim.aspx>

<sup>13</sup> Retrieved from <http://www.simmersion.com/peoplesim.aspx>

<sup>14</sup> Conducting debriefs after each training activity and instructor-students discussion may be some examples how to achieve this.

The numeric score gives users a baseline achievement level they can try to beat, encouraging repeated practice.

Feedback is not only provided at the end, but throughout the conversation. Interviewers can and get advice from an onscreen coach called “SIMmantha” (Figure 2-B). In order to gain additional information, user has two buttons on his disposal - “Help with what I said” button (allows user to ask SIMmantha regarding further insight into his choices) and “Help on what the character said” button (users can ask SIMmantha to explain what the character is thinking and suggest next steps) (Figure 1-H). SIMmantha gives users nonverbal feedback based on their conversation choices to indicate performance ranging from poor to excellent. She also indicates when a choice may be better in some situations than in others (Figure 3).



Figure 3. Some examples of nonverbal feedbacks given from on screen coach called SIMmantha.

SIMmantha’s help may be hyperlinked to relevant parts of the e-learning material that accompanied software for a brief refresher of the classroom content. Additionally, users can access the e-learning material at any time, even as they are playing the simulation.

The transcript feature (Figure 2-E) shows everything that’s been said in conversation and lets user reply or rewind his conversation. If one of user’s statements or questions is in red, that was a poor choice for that point in your conversation. To find out why it was a poor choice or why the character reacted to what was said, user should click on the relevant row and click the “Help with what I said” or “Help with what the character said” buttons.

If the user decides the character is guilty, he or she must attempt to solicit a confession and locate the stolen items. The outcome is dependent upon method of solicitation chosen, versus the personality traits of the character. If innocent, there are exit statements to choose to release the interviewee. If the interviewer makes a mistake, unlike interviews with a real person, this conversation can be restarted with the character having no recollection of the previous series of remarks and questions. The interviewer can start a new interview with an entirely different character by restarting the program. The computer will select a new persona at random to begin a new interview (Parlow, Thompson, n.d.:2).

At the end, the most similar learning experience to computer driven simulations is traditional role play. This kind of training has several advantages over it that can be seen in Table 1.

SIMmersion Training Systems	Role-Plays
Provide valuable skill-building practice any time, without needing an instructor or role-play partner.	Only happen when there is a facilitator and a role-player.
Have scripts that capture what real people say in what are often difficult situations. Professional actors play the roles to ensure a realistic training experience.	Often have peers and instructors as role-players who can create unrealistic or uncomfortable experiences.
Have characters who portray a range of behaviors and personalities for an engaging, generalizable conversation that is different every time.	Provide a singular experience that’s only useful when you talk to that guy.

Can be used days, weeks, or months after initial training. Users can practice with a simulated conversation moments before having a real conversation.	Can only be done during the training session and not as just-in-time refresher practice.
May be played many times. Simulated conversations may take five minutes or over an hour.	Have limited practice time.
Allow users to make mistakes without judgment or embarrassment, which reduces anxiety and leads to better learning.	Create a situation where trainees can become embarrassed about making mistakes.
Provide meaningful, immediate, and objective feedback to reinforce positive behaviors and correct mistakes.	Provide incomplete, inconsistent, and subjective feedback that can make the trainee defensive.

*Table 1. Advantages of the SIMmersion training over traditional role plays. Retrieved from [http://www.simmersion.com/simm\\_vs\\_role\\_play.aspx](http://www.simmersion.com/simm_vs_role_play.aspx)*

## IMMERSIVE LEARNING SIMULATION (ILS) TRAINING

Immersive Learning Simulations (ILS) was developed for the United States Army Criminal Investigation Command (USACIDC) Military Police Investigators. In this simulation user has to interrogate Mike Hagan a young, first time offender suspected of sexual assault. Alike Jennifer Lerner who was portrayed by an actor, Mike Hagan is computer generated character that represents a person in a virtual reality environment (Figure 1 - left)<sup>15</sup>. Similarly to HIITS, this interrogation training system has been designed in a way that the interrogation is driven by the user and that the user is responsible for setting the tone and maintaining pressure on the suspect.

The user selects their response by clicking on the desired response with a mouse. After a response has been selected the interview scenario continues to execute by producing the subsequent subject body language, subject facial expression and subject voice acting and verbal cues that have been authored for the selected response. Throughout the simulation the user has to look for many non-verbal signs as well as micro expressions. All of them are computer animated in a way they look like real-life. There are 44 unique types of the suspect's body language animations<sup>16</sup> that are designed for depicting of deception and simulating human behavior (Figure 4). These animations can be combined in different ways, so many emotional states could be represented.

<sup>15</sup> The main disadvantages of computer based characters is synthetic voice an inability to represent all nuances of human behavior.

<sup>16</sup> Shrugs shoulders, runs hand through hair/hands rub on lap, runs hand behind neck and scratches behind ears, pounds fist on table/pounds fist on leg, clenches fists, clenches jaw, stop hand gesture, smile/ happy/ excited/ enthusiasm, yelling/screaming/cries out, anxious/nervous, puzzled/confused, stares ahead only moving mouth, eyes move upper right, eyes move down left, eyes move quickly up left, eyes squinting, stands up in sprinters stance with fists clenched, pulls head down and shoulders up to hide, covers mouth, dips head down/dips head down and looks sideways, taps foot impatiently, drooping shoulders, micro expression: sadness, micro expression: fear/afraid, micro expression: anger/angry, micro expression: contempt/sarcastic grin, micro expression: disgust/disgusted, micro expression: happiness, micro expression: surprise etc.





Figure 4. Animations designed to communicate emotional states (Mulkern, Punako, 2011).

The distinct feature of this training solution is its ability to simulate proxemics<sup>17</sup>. There is virtual interrogation room that is designed to realistically portray typical real-world interrogation rooms (Figure 5). The room is designed to maximize the effects of proxemics upon the subject. The interrogation training system has been designed to incorporate gesture recognition capability through a Microsoft Kinect as an input device that enables the learner to physically indicate that they are moving closer or further from the subject<sup>18</sup>. In this way, the learner may simulate moving their chair and person close to the subject and patting the subject on the shoulder for comfort and reassurance.



Figure 5. The virtual interrogation room (Mulkern, Punako, 2011).

The software developers put a lot of efforts in simulating facial expressions, especially micro expressions (Figure 6). Because micro expressions are involuntary and brief physical manifestations of the subject's emotions the interrogation simulation has been designed to provide an accurate reproduction showing a micro expression within the standard 1/25 to 1/15 second timeframe<sup>19</sup>.

<sup>17</sup> Proxemics is the reactions of an individual or groups of individuals with relation to the immediate surrounding area. The term is coined by cultural anthropologist Edward Hall in order to emphasize the impact of the use of space (proxemic behavior) on interpersonal communication.

<sup>18</sup> Kinect for Windows gives computers eyes, ears, and a brain. This technology allow their users to interact naturally with computers by simply gesturing and speaking. More details can be found at <http://www.microsoft.com/en-us/kinectforwindows/>

<sup>19</sup> It was not an easy task for software developers to ensure that the software was capable of producing an animation that plays within 0,25 seconds, but they managed to display accurately the micro expressions.





Figure 6. An illustration of contempt and anger on the suspect's face (Luciew, Mulkern, Punako, 2011:8)

It was a real challenge how to find a way to allow the learner to detect micro expressions. The solution was to zoom in automatically to the suspect face when micro expressions may occur and allow the user to press a detection button if they believed that they had observed one. The time between when the button is shown and when it disappears marks the time frame between which an micro expressions may occur. False positive opportunities were created as well (Mulkern, Punako, 2011).

The interview training system design was built on three colored, parallel "event sequence paths" running through five acts including a green path, yellow path and a red path. Each response is assigned a weighted score and is associated with a color that corresponds to the "event sequence path" (red, yellow or green) that the response is a part of. For example, all "red" responses are part of the "red" path. The green path is designed to move the learner through the optimum scenario in which the interviewer will have made all the right decisions in regard to interviewing the child subject. The yellow path is designed to move the learner into some tangles and will meet with some resistance from the subject. The red path is designed to be a halting path of strong resistance, even hostility towards the learner, from the subject. Depending on how far down the red path the learner goes (based on his/her own poor decision making) the suspect can end conversation, refusing to speak without the presence of a lawyer. The user may start on the green path and make a poor decision regarding a technique or line of questioning and be subjected to dropping to the yellow path as a result. The interview training system is designed to allow the user to recover to more optimum paths in some cases by making better decisions at subsequent decision points. However, in some cases, as described for the red path, the user may be subject to premature termination of the interview due to reaching a terminal condition in the path. In this case, the system is designed to simulate an unrecoverable state in which the subject is unable or unwilling to proceed further with the investigation (Luciew, Mulkern, Punako, 2011:8).

## CONCLUSION

In order to obtain the truthful and complete statement regarding suspect's in crime in a way that is in accordance with law, crime investigator must possess adequate skills. The ability to recognize an accurate and honest account of a crime is obviously valuable, particularly in cases in which physical evidence is inconclusive or lacking. If he has no such skills or if they are not applied in an appropriate manner, the offender may leave the interrogation room leaving crime investigator powerless to obtain any information that would help resolve crime. When this happens, the offender becomes more confident and encouraged to commit a new crime. Therefore, training aimed to enhance interview and interrogation skills is a worthy goal deserving attention of police organizations worldwide.

As a first step toward building more effective interrogation training programs it is crucial to evaluate current training practice in order to identify what were the good practices and what should be achieved in future. Some of training methods that are currently used in interrogation training

practice may not support active learning, others may not meet equally the requirements of rookie and veteran investigators, some of them may be too expensive and not affordable due to budget cuts etc. In recent years one method appeared that is able to eliminate the most of the shortcomings contemporary interrogation training systems suffer - computer simulations of the suspect behavior.

Although a completely realistic computer-simulated interrogation is not possible, human behavior can be simulated in such a way to provide significant training value. However, regardless all the advantages of computer based simulations, they cannot replace either student-instructor discussions or real world training. Rather they should be used as a supplement of these training methods.

The multimedia component, coupled with the realistic attitudes of the suspect's character, can greatly enhance the learning process, with or without the presence of an instructor. Simulations can be used at various training courses and seminars, during on the job training or even at the investigator's home. The benefits of virtual interrogation software were the subject of the research conducted in Winona State University campus, in Winona Minnesota, where state and local officers were invited to a three-day training session. After the session, officers took the software home and practiced independently with it for one month. A follow-up survey on the trained techniques use and perceptions of effectiveness was done one year later. Eighteen officers, ranking from Chief to a reserve officer and representing a range state and local agencies, were trained on the virtual system. All officers who completed the training stated they found the techniques easy to learn and had already applied the techniques, with 90.9% stating the techniques were effective when used. Remarkably, 100% of the officers stated they found the use of simulations to be an effective training mode for police officers<sup>20</sup> (Parlow, Thompson, n.d.:3).

There are many other training resources, both commercial and educational, that can be found on the web which are not inherently designed for interrogation training, but can benefit the learning process. For example, Paul Ekman's *Micro Expression Training Tool 3.0* (eMETT 3.0) enables interrogator (trainee) to improve accuracy of spotting micro expressions. It is constantly updated with new faces, extra practice, and Ekman's audio tips<sup>21</sup>. Also there is Ekman's *Subtle Expression Training Tool 3.0* (eSETT 3.0) which could be regarded, according to its creator, as the premier training program for learning how to recognize subtle expressions (very "mini" expressions that often appear in just one region of face, such as the brows, eyelids, cheeks, nose, or lips<sup>22</sup>)<sup>23</sup>.

As it can be seen, modern technology can greatly improve police training. Having in mind the importance of suspect's statements in resolving crimes, and the fact police interrogations are conducted on a daily basis, the advantages of using computer simulations in interrogation training must be recognized, evaluated and implemented in our police practice. This paper may be a first step and a small contribution towards the realization of this goal.

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20 Additional remarks were that they would endorse this training, and some said they would return again and retake this training. Others remarked using this type of interview technique was effective when making investigative traffic stops, and helped with gaining the confidence of drivers. At the conclusion of the training session, officers stated that the techniques would assist not only in their interviews with suspects, but also in everyday conversations and field inquiries (Parlow, Thompson, n.d.:3).

21 The platform for this tool is Web browser with usual system requirements, and it also brings certificate with itself.

22 They can occur when a person is trying to conceal a strong emotion — subtle expression can leak, exposing the true emotion in a tiny change in expression. These small movements may also occur when an emotion is just beginning, often before the person is aware of their emotional state

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## CdTe/ZnS QUANTUM DOTS AS pH-SENSITIVE FLUORESCENT PROBES FOR NH<sub>4</sub>NO<sub>3</sub> DETERMINATION IN EXPLOSION SOIL SAMPLES

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**Abstract:** 3-Mercaptopropionic acid-modified CdTe/ZnS quantum dots were used as pH-sensitive probes for the determination of NH<sub>4</sub>NO<sub>3</sub> in explosion soil samples. In the range of pH 4.8 ~ 8.2 of phosphate buffered saline (PBS) solution, the fluorescence intensity of CdTe quantum dots was linearly proportional to the system acidity. NH<sub>4</sub>NO<sub>3</sub> was used on the role of quenching quantum dots fluorescence. A simple, rapid and specific method for the quick determination of NH<sub>4</sub>NO<sub>3</sub> was proposed. Under the optimal conditions, CdTe/ZnS quantum dots sensitive probe fluorescence quenching level and NH<sub>4</sub>NO<sub>3</sub> concentration showed a good linear relationship in the range of 4.0×10<sup>-6</sup> ~ 5.0×10<sup>-4</sup> mol/L, the detection limit is 3.0×10<sup>-7</sup> mol/L. 5.0×10<sup>-5</sup> mol/L standard solution was determined 11 times, and the relative standard deviation of 2.9% was obtained. For an application, NH<sub>4</sub>NO<sub>3</sub> content in explosion soil samples were measured, as well as the quenching mechanism was described.

**Keywords:** CdTe/ZnS Quantum Dots; pH-Sensitive; Fluorescent Probes; NH<sub>4</sub>NO<sub>3</sub>.

### INTRODUCTION

Quantum dots (QDs) with its excellent physical and chemical properties have aroused widespread concern in the past decade<sup>1, 2, 3, 4, 5, 6</sup>. Compared with conventional organic dyes and fluorescent proteins QDs provide advantages in many aspects such as narrow, tunable wavelengths from the visible to the infrared, symmetric emission spectra, high brightness and photochemical stability<sup>7</sup>. Since 1998, quantum dots which were modified by changing the ligands have been widely used as a fluorescent substance for cell markers, tumor imaging and clinical diagnosis<sup>8, 9, 10</sup>. They are also used in the quantitative detection of biological macromolecules<sup>11, 12</sup> and drugs<sup>13, 14</sup> based on fluorescence quenching effect, which may be due to fluorescence quenching quantum dots caused by changes in the surface state.

In recent years, QDs have attracted considerable attention as novel ion probes. Chen and Rosenzweig demonstrated the first example of Cu<sup>2+</sup> and Zn<sup>2+</sup> ions analysis by utilizing CdS

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luminescent QDs capped by different ligands in aqueous media<sup>15</sup>. Gatta' s-Asfura and Leblanc also described the optical detection of Cu<sup>2+</sup> and Ag<sup>+</sup> with peptide-coated CdS QDs<sup>16</sup>. Now water-soluble CdTe QDs have been utilized as promising pH-sensitive probes<sup>17, 18, 19, 20, 21, 22, 23</sup>. Susha et al. first proposed that water-soluble CdTe QDs would be developed into promising pH-sensitive probes<sup>24</sup>. Yu D H et al. found QDs to be a satisfactory pH probe that could indicate enzymatic hydrolysis of paraoxon<sup>25</sup>. It was found that a subtle perturbation of the surface property of QDs could result in a dramatic change in their fluorescent emission properties. Xia YS et al. investigated the interaction of several cationic surfactants with CdTe QDs modified with thioglycolic acid (TGA)<sup>26</sup>. The results showed that cationic surfactants dramatically quenched the fluorescence of CdTe QDs. The extent of quenching was linearly proportional to the concentration of cationic surfactants from  $2.0 \times 10^{-7}$  to  $7.0 \times 10^{-6}$  mol/L, the detection limit was  $0.5 \times 10^{-6}$  mol/L with correction coefficient 0.997. The above study results are in consistence with that based on the view point of surface chemistry; all the quenching processes of QDs are the result of surface structure change of QDs.

Development on the NH<sub>4</sub>NO<sub>3</sub> explosives detection method has high sensitivity and detection technology, related to social stability, which were associated to public safety issues. It is the current widespread concern of the international community as an important research topic. In this work, a new method for the determination of NH<sub>4</sub>NO<sub>3</sub> was proposed, which takes advantage of CdTe/ZnS QDs as pH-sensitive probes, based on fluorescence quenching extent of CdTe/ZnS QDs caused by pH changes when adding NH<sub>4</sub>NO<sub>3</sub> in aqueous medium.

## EXPERIMENTAL SECTION

### Instruments

Fluorescence spectra were obtained on a LS-55 luminescence spectrometer (Perkin-Elmer, USA). Absorption spectra were recorded on a UV-2100 spectrometer (Rui Li Analytical Instrument Co., Beijing, China). Transmission electron microscope (TEM) of Philips EM420 was used to characterize CdTe/ZnS QDs. Two cuvettes of 1 cm path length were used to measure the fluorescence spectra and absorption spectra, respectively. All optical measurements were performed at room temperature under ambient conditions. pH measurements were made using a pH meter (pH-3C; Hangzhou, China).

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### Reagents and Materials

3-Mercaptopropionic acid (MPA), sodium borohydride (96%), tellurium powder (99.99%) was purchased from the Company of Chemical Reagent in Shanghai, China. Cadmium chloride was purchased from the Beijing Chemical Plant, China. Sodium hydroxide and hydrogen chloride were obtained from Shenyang Huabo Company, China. All chemicals reagents used in the experiments commercially obtained were of analytical grade and were used without further purification; double distilled water was used throughout the experiments.

#### Synthesis of CdTe QDs

The MPA-capped CdTe QDs were synthesized based on our group previous literature report<sup>s27</sup> and briefly described as follows. Sodium hydrogen telluride (NaHTe) solution was produced by reaction of sodium borohydride with tellurium powder in the circumstance of ice bath and vigorously stirred continuously until the black tellurium powder disappeared and sodium tetraborate white precipitation appeared at the bottom of the flask instead. Subsequently, MPA, as a stabilizer, was injected into nitrogen-saturated  $2 \times 10^{-2}$  mol/L CdCl<sub>2</sub> aqueous solution at pH value of 11.6. The molar ratio of Cd<sup>2+</sup>:Te<sup>2-</sup>:MPA was fixed at 1:0.5:2.5<sup>27</sup>. The whole process was performed in the presence of surrounding N<sub>2</sub> and ice bath. Finally, The CdTe precursors were transferred into a polytetrafluorethylene pot. The stable photoluminescent CdTe QDs of different sizes were synthesized at temperature controllable cabinet drier via heating some time at 140 °C. The concentration of CdTe QDs was estimated to be  $5.0 \times 10^{-3}$  mol/L by the final concentration of NaHTe.

#### Purification of CdTe QDs

For the purified CdTe QDs samples, the superfluous Cd<sup>2+</sup> and MPA were removed by repeated centrifugation (more than twice) of the reaction mixtures dissolved in methanol. The freshly prepared CdTe samples were precipitated by methanol, taking the volume ratio CdTe QDs : methanol to be 1:4. The precipitate was isolated by centrifugation at 5000 rpm for 5 min. After purification, the obtained QDs were dried in vacuum at room temperature until the samples reached constant mass. As-prepared MPA-CdTe QDs in powder form were stored at 4 °C in the dark for later use.

#### Synthesis of CdTe/ZnS QDs

Water soluble CdTe/ZnS core-shell QDs were synthesized by over-coating ZnS shell on the CdTe core modifying with MPA. As a typical experiment, 0.5 mmol of ZnSO<sub>4</sub>, 14 mL of water were added to a 100 mL three-necked flask. After on, the mixed solution was stirred under nitrogen at room temperature for 30 min, and 209 μL of MPA was added. Stirring continuously for 5 min, the mixture was adjusted to pH 11 with 1.0 mol/L NaOH. 10 min later, 5 mL of the purified CdTe QDs solution re-dispersed in 3 mL double-distilled water was added, and then 2 mL of 0.25 mol/L Na<sub>2</sub>S solution was quickly injected into the solution after 5 min. The mixture was continuously stirred under N<sub>2</sub> for 10 min, and then the solution was aged at 100 °C under air atmosphere for 3 h to prepare the best phosphorescent CdTe/ZnS core-shell QDs. Finally, the reaction was cooled to room temperature, and the QDs were stored in refrigerator at 4 °C in the dark.

#### Reaction of NH<sub>4</sub>NO<sub>3</sub> with CdTe/ZnS QDs

A volume of 100 μL QDs was transferred into nine 5.0 mL tubes, respectively. Then 0, 10, 50, 125, 250, 500, 750, 1000, and 1250 μL with the concentration of  $1.6 \times 10^{-3}$  mol/L NH<sub>4</sub>NO<sub>3</sub> solutions were added to the tubes, respectively, and the total volume of the mixed solution was made up to 4.0 mL using double distilled water. Concentration of NH<sub>4</sub>NO<sub>3</sub> was  $4.0 \times 10^{-6}$ ,  $2.0 \times 10^{-5}$ ,  $5.0 \times 10^{-5}$ ,  $1.0 \times 10^{-4}$ ,  $2.0 \times 10^{-4}$ ,  $3.0 \times 10^{-4}$ ,  $4.0 \times 10^{-4}$ , and  $5.0 \times 10^{-4}$  mol/L, respectively. The fluorescence spectra were measured in turn within 30 min at room temperature to obtain relative stable and accurate fluorescence intensity. The luminescence intensity of the solution was recorded at 550 nm with excitation wavelength at 380 nm. Both slit widths of excitation and emission were 10 nm.

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## SAMPLE TREATMENT

Tests were carried out on the determination of synthesized explosion soil samples. Explosion soil samples of 5 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.

## RESULTS AND DISCUSSION

### Characterization of CdTe/ZnS QDs

Using the above process, CdTe/ZnS QDs were prepared, and their absorption and photoluminescence spectra are shown in Figure 1. The relative symmetric and narrow fluorescence spectrum indicates that as-prepared CdTe/ZnS QDs are nearly monodispersed and homogenous.

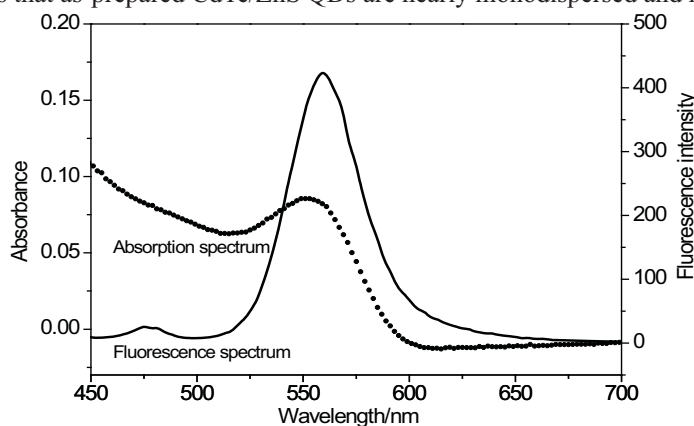


Figure 1. Absorption and fluorescence emission spectra of CdTe/ZnS QDs.

### Fluorescence quenching caused by $\text{NH}_4\text{NO}_3$

In our study, effect of concentration of  $\text{NH}_4\text{NO}_3$  on fluorescent intensity of CdTe/ZnS QDs was investigated in pure water medium. As shown in Figure 2, with the addition of different concentrations of  $\text{NH}_4\text{NO}_3$  solutions, the fluorescence intensity of CdTe/ZnS QDs were quenched obviously. It was found that  $\text{NH}_4\text{NO}_3$  quenched the fluorescence intensity of CdTe/ZnS QDs in a concentration dependence that possesses a good linear relationship. Herein, the dependence between QDs fluorescence intensity and the concentration of  $\text{NH}_4\text{NO}_3$  was established.

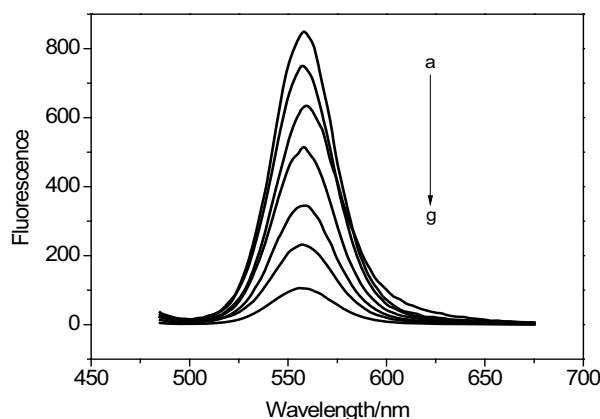


Figure 2. Effect of concentration of  $\text{NH}_4\text{NO}_3$  on fluorescent intensity of CdTe/ZnS QDs (Curve a ~ g, the final concentration of  $\text{NH}_4\text{NO}_3$  was 0,  $4.0 \times 10^{-6}$ ,  $5.0 \times 10^{-5}$ ,  $1.0 \times 10^{-4}$ ,  $2.0 \times 10^{-4}$ ,  $3.0 \times 10^{-4}$ , and  $5.0 \times 10^{-3}$  mol/L, respectively).

### Effect of reaction time

Just as demonstrated in our initial experiments,  $\text{NH}_4\text{NO}_3$  quenching of CdTe/ZnS QDs reached equilibrium within 20 min, and the fluorescence signal kept stable for more than 30 min at the room temperature, which was shown in Figure 3. Based on this phenomenon, we chose 20 min as the optimum reaction time for recording the fluorescence intensity.

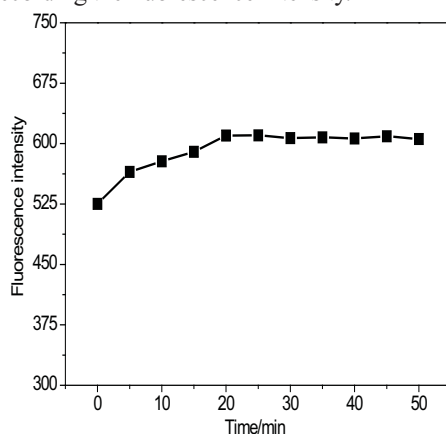


Figure 3. Effect of reaction time on fluorescence intensity of CdTe/ZnS QDs.

### Effect of medium pH

It has been demonstrated that the fluorescence intensity of water-soluble QDs sensitizes with pH values<sup>28</sup>. However, the effect of pH on the fluorescence response of CdTe/ZnS QDs in aqueous solution varied with different reports<sup>28, 29</sup>. As shown in left set of Figure 4, the fluorescence intensity of QDs under different pH values were investigated using 0.05 mol/L PBS buffers in the range between 4.89 and 9.87, which confirmed the above finding. It was found that the fluorescence intensity of QDs linearly increased by 5 fold with pH varying from 5.85 to 8.07, as shown in the right set of Figure 5. The results obtained from this study showed pH in the interval of 5.85 to 8.07, the fluorescence signals of CdTe/ZnS QDs were sensitive to  $\text{H}^+$ .

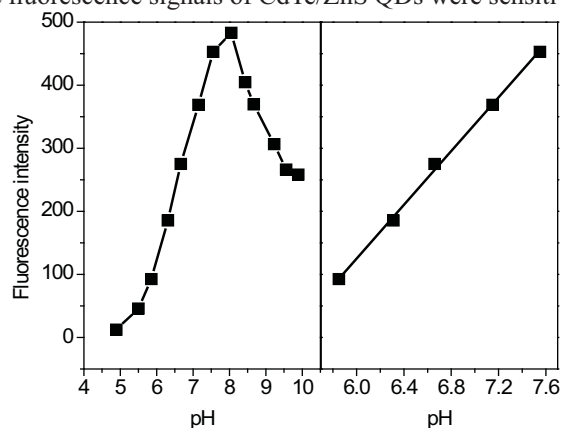


Figure 4. Relationship between fluorescence intensity of QDs and pH values.

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### Effect of the CdTe/ZnS QDs concentration

The concentration of CdTe/ZnS QDs either too high or too low could not obtain optimum detection results. When the concentration of QDs was too high, the relative magnitude of quenching effect by lower concentration of  $\text{NH}_4\text{NO}_3$  decreased, namely, relatively higher concentration of  $\text{NH}_4\text{NO}_3$  will be needed to quench the QDs. Under this condition, the sensitivity for detecting  $\text{NH}_4\text{NO}_3$  will be reduced. However, when the concentration of QDs was too low, QDs were not quantitatively quenched by a given concentration range of  $\text{NH}_4\text{NO}_3$ , that is, the relative limited QDs quenched by higher concentration of  $\text{NH}_4\text{NO}_3$ . Thus, the linear range will be decreased; even the  $\text{NH}_4\text{NO}_3$  in the system cannot be detected accurately, which was shown in Figure 5. Based on these factors,  $5.09 \times 10^{-6}$  mol/L of CdTe/ZnS QDs was adopted.

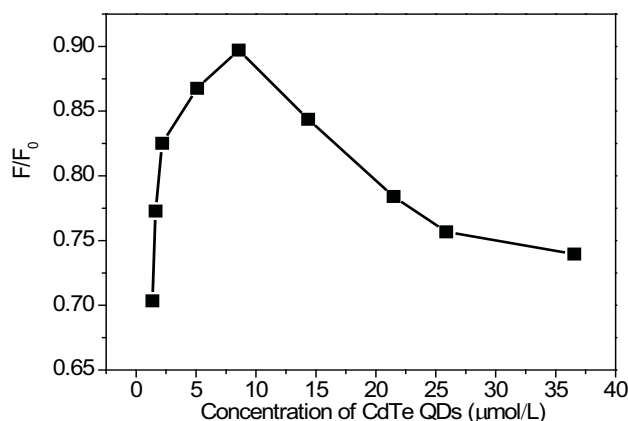


Figure 5. Quenching of  $\text{NH}_4\text{NO}_3$  of  $3.0 \times 10^{-4}$  mol/L on fluorescence intensity of CdTe/ZnS QDs of different concentration.

### Effect of coexisting substances

In order to evaluate other possible interferences in practical application system, a systematic investigation of the interferences of coexisting substances on the determination of  $\text{NH}_4\text{NO}_3$  was carried out. High concentration of  $\text{F}^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{K}^+$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Fe}^{2+}$ ,  $\text{Zn}^{2+}$ , and  $\text{Al}^{3+}$  did not produce any noticeable effect on the fluorescence intensity of CdTe/ZnS QDs. On the other hand,  $\text{Fe}^{3+}$  and some heavy metal ions, such as  $\text{Cu}^{2+}$ ,  $\text{Hg}^{2+}$ ,  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$  and  $\text{Cd}^{2+}$  interfered the fluorescence signal of CdTe/ZnS QDs strongly. Sulfhydryl cotton fiber (SCF) is a kind of good solid absorbent, which could quantitatively absorb a variety of heavy metallic traces from water solutions, and also possesses the advantage of high absorption and adsorption, rapid absorptive rate, good selectivity. In order to eliminate the possible interferences for the determination of  $\text{NH}_4\text{NO}_3$  in explosion soil samples, the explosion soil samples solution was fully filtered by sulfhydryl cotton fiber (SCF) before determination. Thus, the interferences in the process of determination of  $\text{NH}_4\text{NO}_3$  could be ignored. After filtered by SCF, the response of CdTe/ZnS QDs to relevant species was shown in Table 1.

Coexisting substance	Coexisting concentration (10 <sup>-5</sup> mol/L)	Change of fluorescence intensity (%)	Coexisting substance	Coexisting concentration (10 <sup>-5</sup> mol/L)	Change of fluorescence intensity (%)
K <sup>+</sup>	200	+2.35	Cd <sup>2+</sup>	100	+4.22
Mg <sup>2+</sup>	200	-3.12	Pb <sup>2+</sup>	100	-3.69
Ca <sup>2+</sup>	200	+2.67	Hg <sup>2+</sup>	100	-4.17
Al <sup>3+</sup>	200	+3.13	Cu <sup>2+</sup>	100	+4.29
Zn <sup>2+</sup>	200	+2.97	Cl <sup>-</sup>	200	+3.53
Fe <sup>2+</sup>	200	-3.91	Br <sup>-</sup>	200	+3.34
Fe <sup>3+</sup>	100	-4.36	I <sup>-</sup>	200	+2.76
Ag <sup>+</sup>	100	-3.97	SO <sub>4</sub> <sup>2-</sup>	200	+3.61
F <sup>-</sup>	200	-1.92	CO <sub>3</sub> <sup>2-</sup>	200	-4.73

Concentration of NH<sub>4</sub>NO<sub>3</sub>: 2.5×10<sup>-5</sup> mol/L.

Table 1. Influences of coexisted substances.

#### Calibration curve and detection limit

Under the optimal conditions mentioned before, we established relationship between the concentration of NH<sub>4</sub>NO<sub>3</sub> and the fluorescence quenching extent which was caused by NH<sub>4</sub>NO<sub>3</sub>. It was found that NH<sub>4</sub>NO<sub>3</sub> quenched the fluorescence intensity of CdTe/ZnS QDs in a concentration dependence that wasn't fit for the conventional Stern-Volmer plot, which was shown in Figure 6a. Herein, the dependence between QDs fluorescence intensity and the concentration of NH<sub>4</sub>NO<sub>3</sub> is best described by a modified Stern-Volmer equation:  $\lg(F_0/F) = 0.00173C + 0.0478$ , where  $F_0$  and  $F$  are the fluorescence intensity of CdTe/ZnS QDs in the absence and the presence of NH<sub>4</sub>NO<sub>3</sub>, respectively, which is shown in Figure 6b. The results show that the change of relative fluorescence intensity and the concentration of NH<sub>4</sub>NO<sub>3</sub> possess a good linear relationship in the concentration range from 4×10<sup>-6</sup> to 5.0×10<sup>-4</sup> mol/L with a correlation coefficient of 0.9989. The relative standard deviation (n=11) for 5.0×10<sup>-5</sup> mol/L is 2.9%. Following the 3σ IUPAC criteria, the detection limit of 3.0×10<sup>-7</sup> mol/L can be obtained, where σ is the standard deviation of blank signal (n=11). The results show that the present method exhibits good sensitivity and reproducibility.

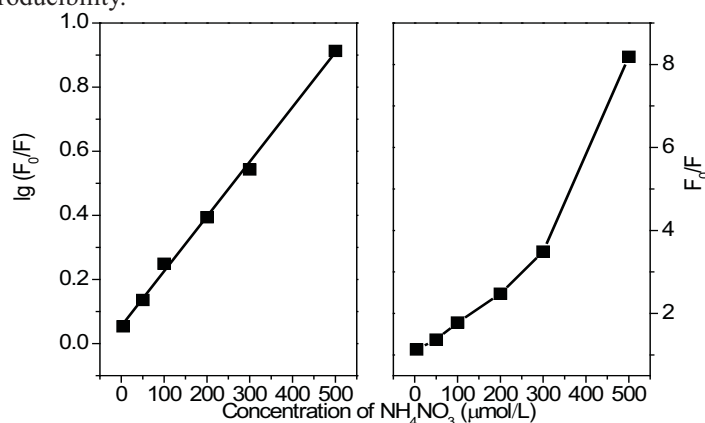


Figure 6. Modified Stern-Volmer plot of NH<sub>4</sub>NO<sub>3</sub> concentration dependence of the fluorescence quenching degree.

### Determination of real samples

The concentrations of  $\text{NH}_4\text{NO}_3$  in explosion soil samples were determined by the standard-curve method which was shown in Fig. 6b. Explosion soil samples of 5 g was weight accurately, using distilled water extraction for 3 times, each time for 5~10 min. Water extract were combined and filtered, and the solution were made up to 50 mL in a volumetric flask.

Before the following fluorescence measurement, 250  $\mu\text{L}$  of  $5.09 \times 10^{-6}$  mol/L CdTe QDs solution was transferred to 10-mL colorimetric tube, then 100- $\mu\text{L}$  treated sample solution were added subsequently and diluted to 10 mL with pure water, and well mixed. After that, the fluorescence measurement was carried out by setting the excitation wavelength at 380 nm. Both of the excitation and emission slits were set at 10 nm. The results are shown in Table 2 and each value was the average of five determinations. The recovery test was carried out in each instance by adding 20, 25, 30  $\mu\text{L}$   $\text{NH}_4\text{NO}_3$  ( $10^{-2}$  mol/L) standard solution to 100  $\mu\text{L}$  sample solution in three different levels and keeping the total volume to 10 mL with pure water before measurement, well mixed. Other procedures were the same as before. The recoveries of the samples were in the range of 90~107%. The determination results achieved by this method were in good agreement with the claimed values.

$\text{NH}_4\text{NO}_3$ found ( $\mu\text{mol/L}$ )	Relative standard deviation (%)	$\text{NH}_4\text{NO}_3$ added ( $\mu\text{mol/L}$ )	Total found ( $\mu\text{mol/L}$ )	Relative standard deviation (%)	Recovery (%)	Relative standard deviation (%)
		20	41	1.72	90.0	3.93
23	2.36	25	47	2.13	96.0	4.17
		30	55	2.57	106.7	4.42

Table 2. Determination of  $\text{NH}_4\text{NO}_3$  in real samples ( $n=5$ ).

### Mechanism

In the process of determination  $\text{NH}_4\text{NO}_3$ , we found that when the concentration of  $\text{NH}_4\text{NO}_3$  was lower than  $4.0 \times 10^{-6}$  mol/L, the fluorescence intensity of CdTe/ZnS QDs was strengthened. On the other hand, as the concentration of  $\text{NH}_4\text{NO}_3$  increased from  $4.0 \times 10^{-6}$ ~ $5.0 \times 10^{-5}$  mol/L, the fluorescence intensity of CdTe/ZnS QDs was quenched significantly. As the concentration of  $\text{NH}_4\text{NO}_3$  was higher than  $5.0 \times 10^{-4}$  mol/L, the fluorescence intensity of CdTe/ZnS QDs was very low. Based on the above phenomenon, the probable fluorescence increasing mechanism can be explained as the hydrogen bond interaction between the hydroxyl of  $\text{NH}_4\text{NO}_3$  and carboxyl of CdTe/ZnS QDs surface. With the increase of  $\text{NH}_4\text{NO}_3$ , the quenching effect was stronger than hydrogen bond interaction. Herein, the probable quenching mechanism can be explained as follows: First, it was reported that small cations can pass through the shell layer and interact with the core. In our thesis, it also may be that not all particles of QDs are perfectly capped with the shell and the added  $\text{H}^+$  can pass through the shell layer and interact with the core. Further more, the added  $\text{H}^+$  leading to a portion of MPA dissociated from the nanoparticle surface, resulting in a lower surface charge, and the uncapped QDs trended to aggregate. Third, the addition of  $\text{H}^+$  may cause reversible reaction and Te is oxidized by oxygen and precipitated from the solution. By far, the mechanism is no verdict. But from the viewpoint of surface chemistry, all the quenching processes of QDs maybe the result of surface structure change of QDs.

## CONCLUSIONS

Water-soluble CdTe/ZnS QDs are found to be a satisfactory pH probe that could have potential applications in chemical and biochemical sensing. Herein, we have established a simple novel method for quick, accurate and sensitive determination  $\text{NH}_4\text{NO}_3$  based on fluorescence quenching of CdTe/ZnS QDs. The quenching process was described by a modified Stern-Vol-

mer type equation. The effects of concentration of the QDs, and pH value on the determination of  $\text{NH}_4\text{NO}_3$  were discussed. The proposed method has been applied to determination of  $\text{NH}_4\text{NO}_3$  in explosion soil samples, which agreed with the claimed value, suggesting that the method is reliable and practical. It is feasible to develop a simple assay kit for determination of  $\text{NH}_4\text{NO}_3$  without using expensive instrumental set-up. These results point out the potential use of water-soluble CdTe/ZnS QDs as selective pH sensors.

### ACKNOWLEDGMENTS

The authors are grateful for the financial support from National Natural Science Foundation of China (No. 20875011) and Innovation Subject of National Police University of China Undergraduates (No. 201210175033).

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## MOVING HUMAN DETECTION AND ABNORMAL BEHAVIOR ANALYSIS IN SURVEILLANCE VIDEO

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**Abstract:** Intelligent video surveillance is a present research focus in the field of computer vision, which is taking more and more attention. The moving human body detection and the analysis of human abnormal behavior in video is an increasingly important research direction of intelligent video surveillance system. The analysis of human abnormal behavior has broad application prospect in plenty of field such as traffic monitoring, medical care, safety protection and video retrieval based on human behavior. At first, the article briefly introduces the research background and the development state of the technology worldwide. Secondly, it focuses on algorithms for moving objects detection and tracking followed by the abnormal behavior recognition. Because video image is very complex, providing a truly robust algorithm of human abnormal activity, recognition is still a challenging task.

**Keywords:** moving objects detection, abnormal behavior recognition.

### RESERCH BACKGROUND

In recent years, due to the need for public safety, many domestic and foreign universities and research institutions are dedicated to studying on the intelligent video surveillance technology. Hence, the human abnormal behavior identification has become the main research content.

In 1997, with the support of Defense Advanced Research Projects Agency, the Robotics Institute of Carnegie Mellon University and the Sarnoff Corporation begin to develop the Video Surveillance and Monitoring (VSAM) system. The system imitates the motion sensibility of human vision, empowers the machine with the ability of perceiving the target motion in the image sequence, and provides an important data source for visual analysis. The goal of VSAM is to automatically collect and disseminate real-time information of battlefield in order to improve the situational awareness of commander and staff.<sup>1</sup> The research of Context Aware Vision using Image-based Active Recognition (CAVIAR) project was conducted in association with the United Kingdom, Portugal and France from 2002 to 2005. The system automatically analyses the video stream which is captured from the cameras, and alerts security staff if any dangers were detected.<sup>2</sup> The initial research in China is relatively drop-behind, but the key technology of the recognition of human behavior has been researched in-depth by plenty of excellent universities and institutions such as the National Laboratory of Pattern Recognition (NLPR) of Institute of Automation of Chinese Academy of Sciences (CAS), Microsoft Asia academe, Vision National Laboratory on Machine Perception of Peking University, Tsinghua University and so on.

### MOVING OBJECT DETECTION

Moving Object Detection is the basic function of the video surveillance system. When the moving object is detected, the system can operate the subsequent processing. Moving Object Detection is the basis of computer vision underlying module, and the purpose is to separate the image of moving object from the background in the video sequences. The effect of motion detection will directly affect the accuracy of subsequent target tracking and behavior analysis. However, in the real scene, due to weather changes, the shadow of the object, camera shake and other factors, the accuracy of the moving target detection will be decreased. Therefore, it is important to choose the suitable moving target detection algorithm to apply in practice. The following will mainly discuss three algorithms which are commonly used in practical engineering applications.

<sup>1</sup> Nael Hirzallah. Automated Camera Monitoring System for Selective Areas of Interest [J], Journal of Computer Science 3 (2): 62-66, 2007.

<sup>2</sup> <http://homepages.inf.ed.ac.uk/rbf/CAVIAR/>

### Optical Flow Method

Optical flow<sup>3</sup> is a simple and practical way to express the moving of the image. When the object in the image is moving, the points in the image correspond to the points on the moving object perfectly. We assign a velocity vector for each point in the image, and we can analyze the image according to the feature of the velocity vector of each pixel in the image. If there is none of moving object in the image, the change of the optical flow vector is continuous. If there are some moving objects in the image, relative movement between the background and the moving objects will occur. In the meantime, there are differences in the optical flow vector between the background and the moving object. We can find the position of the moving object in the image by the analysis of the differences, and then achieve the object detection.

Defining the gray level of the image pixel in the coordinate  $(x, y)$  as  $I(x, y, t)$  at time  $t$ , we define  $u$  as the optical flow vector of each pixel in the  $x$  direction component  $dx/dt$  and  $v$  as the optical flow vector of each pixel in the  $y$  direction component  $dy/dt$ .  $I_x, I_y, I_t$  are respectively the partial derivative of the pixel gray level in  $x, y, t$  direction. We believe that the brightness of the optical flow field in two consecutive frames in image sequences remain unchanged, we have<sup>4</sup>:

$$I(x, y, t) = I(x + dx, y + dy, t + dt) \quad (2.1.1)$$

Unfold the right side of the equation to Taylor series expansion:

$$I(x, y, t) = I(x, y, t) + I_x \frac{dx}{dt} + I_y \frac{dy}{dt} + I_t + o(dt^2) \quad (2.1.2)$$

$$I_x u + I_y v + I_t = 0 \quad (2.1.3)$$

The advantage of optical flow method is adaptable, because the optical flow carries not only the moving information of the object, but also the information about the three-dimensional structure of the scene. In the case of the scene information is unsure the moving object can be detected through this method. But in applications, due to occlusion, multiple light sources and other reasons, the gray level conservation assumption of the optical flow basic equations cannot be established. The moving object detection algorithm based on optical flow method is very complex. It requires a large amount of calculation, at the same time the real-time performance and accuracy of it are relatively poor. Most of the cameras in the video surveillance systems are recording video in the stationary state, because they are not used in the moving state, using this method to detect the moving object in the system which requires real-time performance is not appropriate. We usually detect the moving object by the combination of optical flow method and other methods.

### Inter-frame difference method

Inter-frame difference method<sup>5</sup> is one of the most commonly used methods for moving object detection and segmentation. Using the method, we can detect the moving object by the difference between two images at different time which have the same background. The basic principle of the method is subtract two pixels which in the same coordinate but belong to sequence frame in the image, and we can get the information of the moving object from the results. The object is considered static in the case of the difference between the two gray levels of the pixels is very small and the brightness of the environment slightly changes. If the gray levels of the pixels in the image changes greatly, we can think it is caused by the movement of object in the image. When we get the areas that have the pixels with great change in the subtract we can locate the position of the moving object from the areas. The advantages of the inter-frame difference method are not only fast, but also adaptive in the dynamic background and robustness

3 Yalin X, Steven A S. Moment and Hyper Geometric Filter for High Precision Computation of Focus, Stereo and Optical Flow [J]. International Journal of Computer Vision, 1997, 22(1): 25-29.

4 Nie Weile, Qu jianrong. Simulation for moving target processing algorithm based on OpenCV [J]. Journal of Applied Optics, 2008, 29(6): 867-869.

5 Lipton A, Fujiyoshi H, Patil R. Moving Target Classification and Tracking from Real-time Video [C]. Proceedings of IEEE Workshop on Application of Computer Vision, 1998: 8-14.

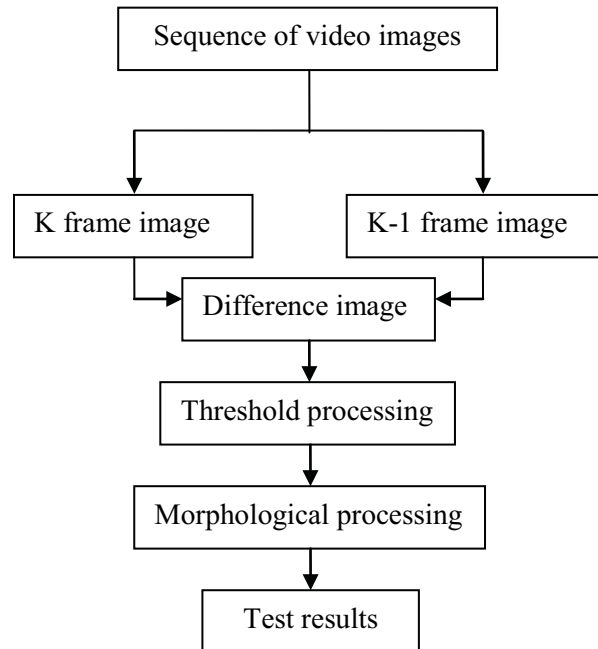


Fig. 1 Inter-frame difference method

Figure 1 is a flow chart of the inter-frame difference algorithm method. Assuming  $F_k(x, y)$  and  $F_{k-1}(x, y)$  are the  $k-1$  and  $k$  frame image respectively,  $D_k(x, y)$  is the difference image of two frames. In the algorithm, the value of the threshold has been set as  $T$ . When the gray level difference between the pixels  $F_k(x, y)$  and the pixels  $F_{k-1}(x, y)$  are bigger than  $T$ , the binarization of  $D_k(x, y)$  is 1, and the points considered belong to the moving object. When the gray level difference between the pixels  $F_k(x, y)$  and  $F_{k-1}(x, y)$  is less than  $T$ , the binarization of  $D_k(x, y)$  is 0, the points considered belong to the background.

Specific formulas such as (2.2.1) as follows:

$$D_k(x, y) = \begin{cases} 1 & |F_k(x, y) - F_{k-1}(x, y)| \geq T \\ 0 & |F_k(x, y) - F_{k-1}(x, y)| < T \end{cases} \quad (2.2.1)$$

In the inter-frame, the selection of threshold and the time difference between two frames are the difficulties of processing methods. The threshold selection is very important. If the threshold is too large, it will cause the object pixel block is very trivial, object extraction will not complete. If the threshold is too small, parts of the background will be misjudged as the moving object. So the threshold should be set appropriate value according to the current status. In the method, the moving object is extracted from the background based on the changing of the object movement in sequence time. So the time difference also affects target extraction effect. If the time difference is too small, the slow moving objects will not be detected. If the time difference is too large, the fast moving objects will be detected as two separate targets.

#### Background Difference Method

In addition to inter-frame difference method, background difference method<sup>6</sup> is another common method to detect the moving object in stationary or slowly changing background. Build the background model by estimating the unchanged background in the image sequences, and the moving object in the current frame can be extracted based on the model. The basic idea of the method is subtract the current frame image from background, and then judge whether there is something abnormal happened based on the changing of the gray level and the histograms statistics information in the result. The simple and commonly used method for modeling are:

6 Chang xiaofeng, Fen xiaoyi. A New Method of Detection Based on Background Subtraction and Spatial Temporal Entropy [J]. Computer Simulation, 2008, 25(4): 235-238.

extract an image in the video sequence, or take averaging multiple images as a background. The background subtraction algorithm flow chart is shown in Figure 2:

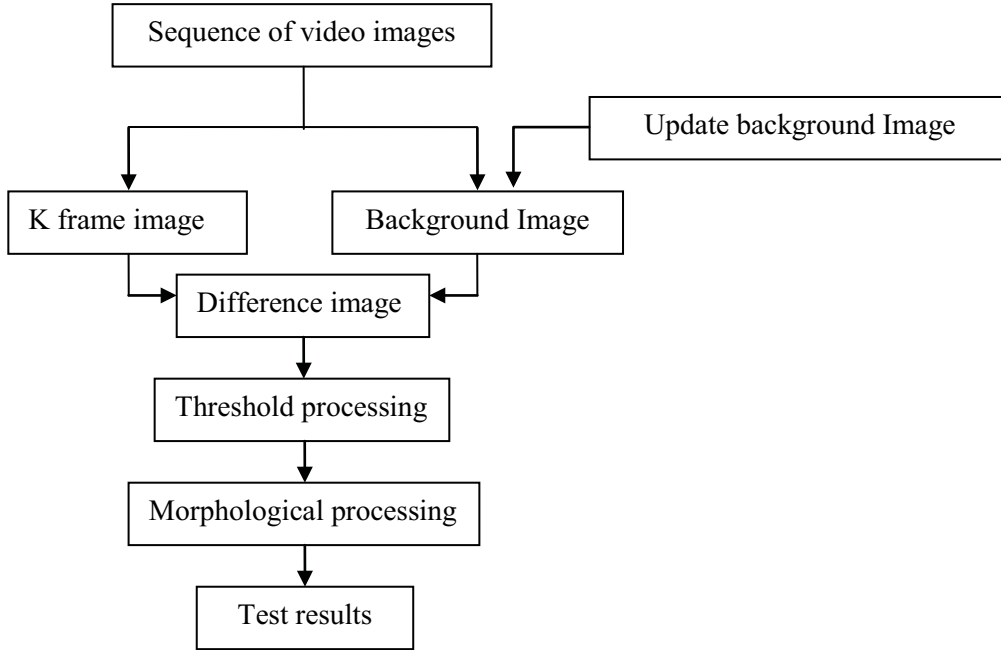


Fig. 2 Background difference method

The formula is as follows:

$$D_k(x, y) = \begin{cases} 1 & |F_k(x, y) - B_k(x, y)| \geq T \\ 0 & |F_k(x, y) - B_k(x, y)| < T \end{cases} \quad (2.3.1)$$

In the equation,  $F_k(x, y)$  is the current frame image,  $B_k(x, y)$  is the background image,  $T$  is the threshold value,  $D_k(x, y)$  is the difference image. When the gray level difference between the corresponding pixel in current frame image  $F_k(x, y)$  and the background image  $B_k(x, y)$ , the binarization of  $D_k(x, y)$  is 1, and the pixel is identified belong to the moving object. Otherwise, the pixel is identified belong to the background.

$$B_k(x, y) = \begin{cases} \partial B_{k-1}(x, y) + (1 - \partial)F_k(x, y) & |F_k(x, y) - B_{k-1}(x, y)| < T \\ B_{k-1}(x, y) & |F_k(x, y) - B_{k-1}(x, y)| \geq T \end{cases} \quad (2.3.2)$$

We can see from the equation, when the difference between current frame image and the background image is less than  $T$ , updated the background using the image based on the current pixel. Otherwise, the keep the background remain unchanged.  $\partial$  is the updated coefficient, it should be set appropriate value according to the environmental variation speed.

The background subtraction method can completely extract the moving object, because the algorithm is simple and easy to implement, and meet real-time requirements, it is a common method for video surveillance in object detection. However, due to this method is sensitive to the changes of the background it doesn't suit to be used in video which background is rapidly changing.

### ABNORMAL HUMAN BEHAVIOR ANALYSIS

The ultimate goal of the intelligent video surveillance enables a computer to analyze and understand the reality of the environment. Behavioral description and analysis is a senior processing, it is the further processing of moving object detection and tracking. Now, most of the monitoring systems only detect the moving object in the scene, they have no ability to differentiate the abnormal behavior from normal behavior. In these systems a great deal of manpower is required in order to find the abnormal behavior, but they cannot guarantee the real-time processing of the accident. For example, in the elderly fall accident, if accident is not promptly detected and handled, lots of serious consequences may be caused sometimes. If somebody wandering in the sensitive area such as the military bases around, the front of the bank ATM or the kindergarten for a long time, he/she could be a threat to national security, people's property or the safety of children. Because he/she should not hover in above regions long time, so we should pay attention to that person. In some cases, the baggage or other potentially dangerous objects are left in a public place. Intelligent monitoring can solve the problem in the above situation through human abnormal behavior analysis technology.

### HUMAN MOVEMENT FEATURE EXTRACTION

The paper focuses on human body as the main research target, the moving human body is represented by its external rectangle. The rectangular composed by the intersection of the range  $[x_{\min}, x_{\max}]$  and  $[y_{\min}, y_{\max}]$  can be used to describe the motion area. In order to make the description concise, we use the top left corner  $P_1(x_1, y_1)$  and the bottom right corner  $P_2(x_2, y_2)$  indicates the rectangle  $Rect[P_1, P_2]$ . The rectangle is represented in Figure 3.

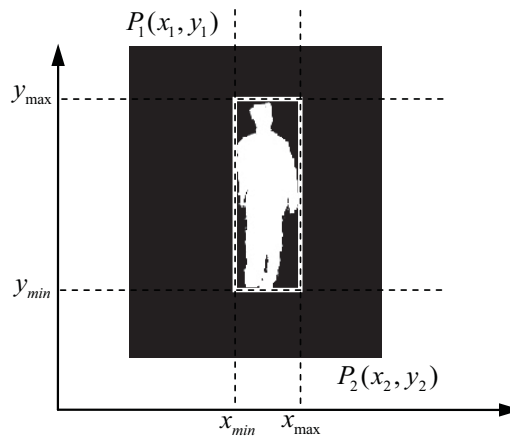


Fig. 3 The rectangle  $Rect[P_1, P_2]$

Instead of point, the moving human body in the image is a region, in other words, it is composed of many points in this region. If we express the movement of the human body by each point in the region, the computation is too large. We need to choose some special points which can represent the moving human body and express the spatial characteristics information. The moving human body's centroid is the point which fits our requirements and its coordinates are represented by the following.

$$x_{mid} = \frac{\sum_{(x,y) \in Rect[P_1, P_2]} x \cdot H(x, y)}{\sum_{(x,y) \in Rect[P_1, P_2]} H(x, y)} \quad (3.1.1)$$



$$y_{mid} = \frac{\sum_{(x,y) \in Rect[P_1, P_2]} y \cdot H(x, y)}{\sum_{(x,y) \in Rect[P_1, P_2]} H(x, y)} \quad (3.1.2)$$

$H(x, y)$  is the gray level of pixel  $(x, y)$  in the moving human area  $Rect[P_1, P_2]$ . Because the human body's centroid will be slightly affected by moving, rotating, stretching, and noise and other factors, its position will not change greatly, so we can represent the moving human by the centroid. The experimental results as shown in Figure 4, the red rectangle represent the human and the pink points are the centroid of the body in the sequence frame. We can see the method is robust.

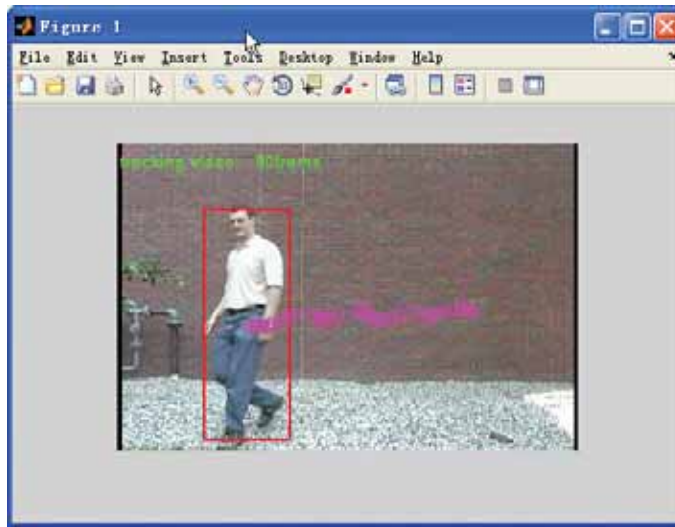


Fig. 4 Human motion centroid trail

## SEVERAL COMMON HUMAN ABNORMAL BEHAVIOR DETECTION METHODS

### Human body fall detection

When the human body in the video falls, the most obvious feature is the contour of the body change and the centroid descend. According to the above methods used commonly based on the geometric characteristics, we cannot detect the accident by the comparison of the height and width of moving human body. When the human body is away from or close to the camera, the height and width will change, but the ratio of them will not. In the paper, the moving human body fall is detected by the changing of the body's centroid and the ratio of the external rectangle height and width.

The processing is follows:

(1) We set  $P$  as the ratio of the external rectangle height and width, and  $P = Height / Width$ . When the human body falls, the ratio is also changed.

$$K = \begin{cases} 1; & P < T_1 \\ 0; & P > T_1 \end{cases} \quad (3.2.1)$$

$T_1$  is the threshold of ratio, assigned according to the actual situation of video and camera angle. When  $P$  is greater than  $T_1$ , the  $K$  is equal to 0, and we believe that the body is in the upright position. When  $P$  is less than  $T_1$ , the  $K$  is equal to 1, and we believe that maybe the body falls.

(2) When the body falls, the centroid of the body will fall. Because one point on the moving human body cannot fully reflect the movement state of the body, we use the difference distribution  $\beta$  of the centroid represent the state of human motion in the paper.

$$\beta = |(\sum_{i=1}^n y_i) / n - y_n| \quad (3.2.2)$$

In the above equation,  $y_n$  is the ordinate of the N-th centroid,  $(\sum_{i=1}^n y_i) / n$  is the average of the first  $n$  centroid ordinate. When the state of human motion is normal, the value of  $\beta$  varies between little ranges. When the body falls, the value of  $\beta$  will suddenly increase.

$$L = \begin{cases} 1; & \beta > T_2 \\ 0; & \beta < T_2 \end{cases} \quad (3.2.3)$$

$T_2$  is the threshold of the range. When  $\beta$  is less than  $T_2$ , the  $L$  is equal to 0, we believe that the body is in the upright position. On the contrary, the  $L$  is equal to 1, and we believe that maybe the body falls.

If the  $K$  and  $L$  are equal to 1 at the same time, we believe that the body falls, and start to timing. When the interval time is longer than threshold, we believe that the people cannot stand up, and the system alerts at this time.

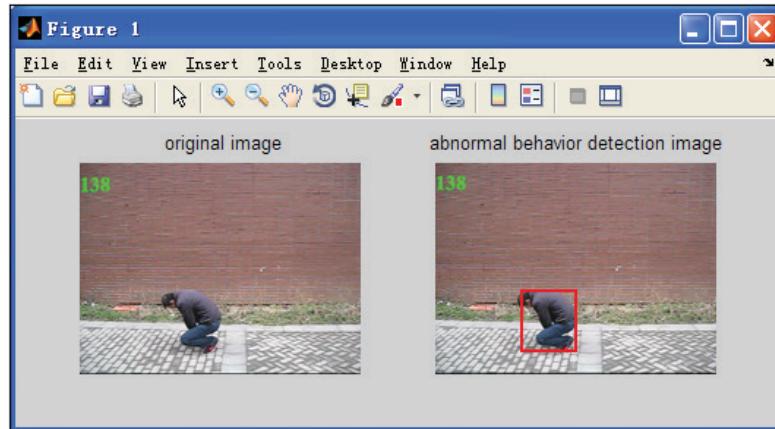


Fig. 5 The experimental result of human body fall detection

Figure 5 is the actual results of human body fall detection experiment, the green figures in the upper left corner of the image is the current video frame number. If the squatting time of the person is too long, and over the threshold, the external rectangle of human body turns red. We believe that the person cannot stand up and need assistance. The system will alerts at the same time.

#### Remnants detection

The remnants detection method described in this article is based on temporal logic and spatial motion information, an important feature of remnants detection is that the separated parts of the moving object are remain stationary in the scene, which is quite different from the moving object detection in the video surveillance system. According to the time duration when the ob-

ject is stationary, the distance of its position from the human body position judges if the object is remnant. The method avoids sample training, decreases the calculation, and improves real-time performance of the system. The algorithm includes the following steps:

(1) To detect the foreground object by the background difference methods, and to process the image of the foreground object by median filter and morphological method.

(2) To extract the motion information of the foreground objects, and to create statistics template  $S(x, y)$  of the stationary foreground for counting the stationary pixels in the foreground objects image.

(3) To analyze the trace of the moving object based on the motion information, and to identify the motion state; to count the time duration when the object is stationary, if the time exceeds the threshold, it is sure that the object is suspicious remnant.

(4) To match the image of the suspicious remnant with the image of the stationary foreground statistics template  $S(x, y)$  based on the overlapping area. When the area exceeds the threshold, the object is identified as remnant, and the system will alert the remnant with a red rectangular box.



Fig. 6 The experimental result of remnants detection

Figure 6 is experimental result of remnants detection. The green text in the upper left corner of the image is the current video frame number. We mark the normal object by the blue rectangle. We can see the object is not separated from the human body in figure (a). In figure (b), the object is separated from the human body, but the distance between the object and human body is less than the distance threshold and both, the object and the human body, are stationary so the object is not identified as remnant. After a period, the human body begin moving to the direction away from the object, because the distance between the object and human body is still

less than the distance threshold in figure (c) the object is not identified as remnant. In figure (d), when the system detects the distance exceeds the distance threshold, the external rectangular of object turn red.

### Human body hovering detection

The hovering behavior refers to the human body back and forth movement in certain areas. Before the hovering detection research, the paper introduces a method for the analysis of the moving object trajectory: distance to angle method. The principle of the method is transforming the coordinates of the moving object from  $(x, y)$  to  $(\lambda, \theta)$ <sup>7</sup>. The  $\lambda$  is defined as the distance between two neighbor points on the trajectory, and the  $\theta$  is defined as the included angle which is between the connection of the two neighbor points and the horizontal axis. Its variation range  $[-180^\circ, +180^\circ]$ . When the object moves counterclockwise, the angle is positive; when the object moves clockwise, the angle is negative. In the process of coordinates transforming, each  $(\lambda, \theta)$  values is calculated via two neighbor points on the trajectory.

The moving object coordinate at time  $t-1$  is  $(x_{t-1}, y_{t-1})$ , its coordinates of the time  $t$  is  $(x_t, y_t)$ . The distance between the object position at time  $t-1$  and the position at time  $t$  is expressed as:

$$\lambda_t = \sqrt{(x_t - x_{t-1})^2 + (y_t - y_{t-1})^2} \quad (3.2.4)$$

The included angle  $\theta_t$  can be calculated as following:

$$\theta_t = \begin{cases} \arccos \frac{x_t - x_{t-1}}{\lambda_t} = \arccos \frac{x_t - x_{t-1}}{\sqrt{(x_t - x_{t-1})^2 + (y_t - y_{t-1})^2}}; & y_t - y_{t-1} \geq 0 \\ -\arccos \frac{x_t - x_{t-1}}{\lambda_t} = -\arccos \frac{x_t - x_{t-1}}{\sqrt{(x_t - x_{t-1})^2 + (y_t - y_{t-1})^2}}; & y_t - y_{t-1} < 0 \end{cases} \quad (3.2.5)$$

We define the moving object angle difference at time  $t$  as  $\Delta\theta = |\theta_t - \theta_{t-1}|$ .

The body hovering can be summarized as the following features:

1. The human body changes the direction of the movement frequently
2. The distance between the current position of the human body and the position where the human body enters the scene will not constantly increasing or decreasing. It increases or decreases at times, the two processes are alternated.
3. The human body stays in the scene for a long period of time.

In the human body hovering detection, the trajectory of the human body is represented by the sequence data of the human body centroid coordinates. In the paper, we judge whether the human body is hovering by the three rules based on the characteristics.

(1) Using the changes of the angle difference  $\Delta\theta$  to judge whether human body moving direction is changed. Through the analysis of the human body movement trajectory, we can calculate the direction angle  $\theta$ . So we can judge whether human body moving direction is changed based on angle difference. When  $\Delta\theta$  exceed  $90^\circ$ , we believe that the maybe human body moving direction is changed. Figure 7 presents us with the change of the angle difference  $\Delta\theta$  when the movement direction changes. In the figure  $P_{t-\Delta t}, P_t, P_{t+\Delta t}$  are the points in the moving human body trajectory. The  $\theta_1$  is the included angle between the connection of the neighboring points  $P_{t-\Delta t}, P_t$  and the horizontal axis, and the  $\theta_2$  is the included angle between the connection of the neighboring points  $P_t, P_{t+\Delta t}$  and the horizontal axis. Using the formula (3.2.5) we can calculate the value of  $\theta_1$  and  $\theta_2$ , and from the figure it is obvious that the angle difference exceeds  $90^\circ$ . Thus, we believe the movement direction of the human body is changed in the trajectory.

<sup>7</sup> Ting Lin. Research and Implementation of Human Abnormal Behavior Analysis in Video Surveillance [D]. Nanjing University of Posts and Telecommunications. 2012.

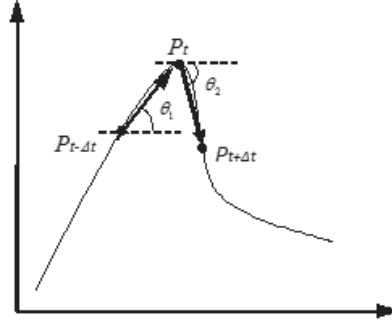


Fig. 7 The movement direction change of the human body

(2) Calculate the distance between the mean of the moving human body's centroid coordinates and the initial position when the human body entered the scene. The mean of centroid coordinates is defined as  $\bar{P}_t$  in the formula (3.2.6), and the distance is defined as  $\Delta S$  in the formula (3.2.7).

$$\bar{P}_t = \left( \sum_{t-M+1}^t P_i \right) / M \quad (3.2.6)$$

$$\Delta S = \sqrt{(x_t - x_0)^2 + (y_t - y_0)^2} \quad (3.2.7)$$

In the formula (3.2.6)  $P_i$  the  $i$ -th coordinate of the centroid in the video sequences, and the  $M$  is a constant. In the formula (3.2.7)  $x_t, y_t$  are the average centroid coordinates of moving human body, and  $x_0, y_0$  are coordinates of the position where the human body enters the scene. When  $\Delta S$  is constantly increasing or decreasing, we identify that human body is walking normally. When  $\Delta S$  show alternately increase and decrease, we judge that the human body maybe is hovering, and follow the next step.

(3) Record the time while the human body stays in the scene. We define the time as  $T$ . If  $T$  is less than the time threshold, we judge that the human body is not hovering. If the  $T$  exceeds the time threshold, we judge that the human body is hovering.

The algorithm of hovering body detection comprises the following steps:

1. Extracting the moving object from the original video sequences, and calculating the centroid coordinates of the moving object.

2. Tracking the moving object, recording the coordinates of the centroid position of each frame in the video sequences. The trajectory of the moving object can be represented by the coordinate sequences  $\{(x_1, y_1), (x_2, y_2) \dots (x_n, y_n)\}$

3. According to the rule (1), we can calculate the angle difference  $\Delta\theta$  by using the coordinates of the centroid  $P_t, P_{t-\Delta t}$  and formula (3.25). When  $\Delta\theta$  is over  $90^\circ$ , the value of the directional counter is plus 1, and we jump to the next step. Otherwise, we are supposed to return to step 2.

4. When the value of the directional counter exceeds the threshold  $K$ , which is set according to the actual situation, continues detection based on rule (2). Calculate the distance between the position of the human body centroid and the position where the human body enters the scene. If the result meets the rule (2), then follow step 5, otherwise return to step 2.

5. According to the rule (3), if the time exceeds the threshold, we identify that the human body is hovering. Otherwise, we are supposed to return to step 1.



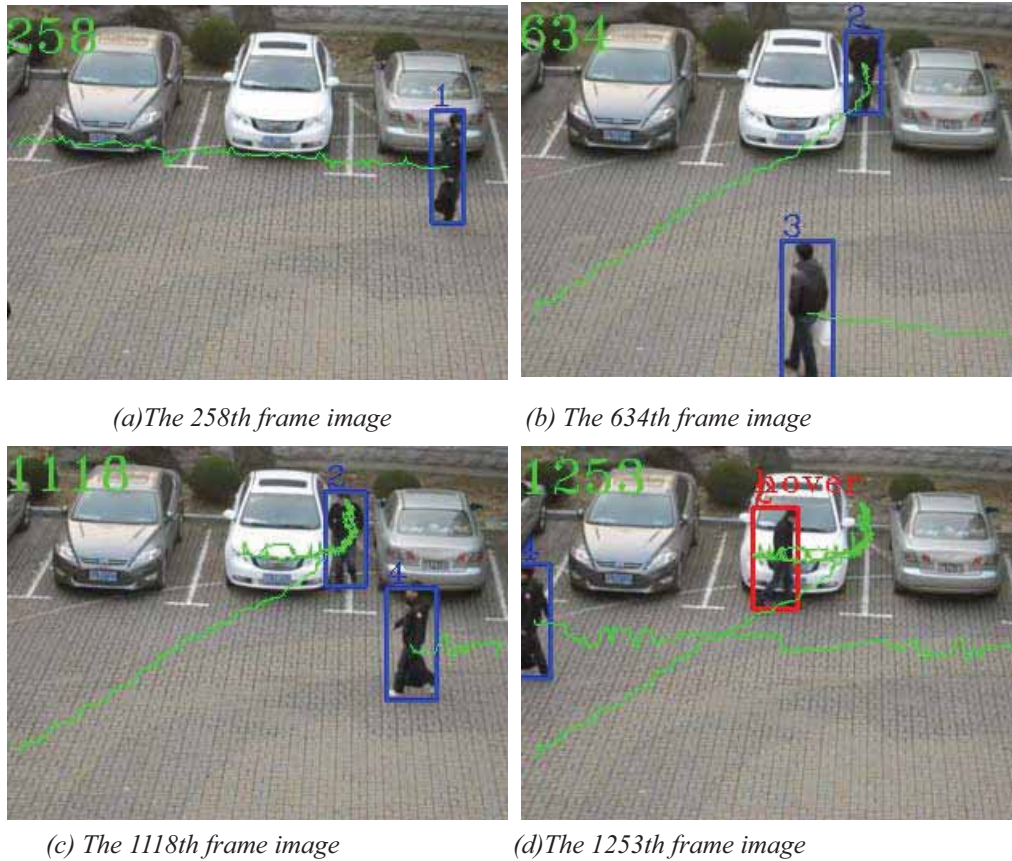


Fig. 8 The experimental results of human hovering detection

Figure 8 are the experimental results of the human hovering detection. The green numbers in the upper left corner of the images are the current video frame numbers and the green curves are the trajectory of the human body's centroid. When the human is walking normally, the external rectangular of human body is blue. When the abnormality of his motion was found, the system will mark it with the red rectangular frame. From the result we can see, the moving directions of the human body's centroids in the figure (a) and figure (b) are unchanged. The moving direction of the human2 body's centroid in the figure (c) is changed because his movement direction is changed. But the moving direction of the human4 body's centroid in the figure (c) is changed because his motion range is too large. In the figure (d), the human4 body's external rectangular is blue because the  $\Delta S$  is constantly increasing, we identify that human4 is walking normally. The human2 body's external rectangular is red because the  $\Delta S$  show alternately increase and decrease, so we identify the motion of human2 body as hovering behavior.

## CONCLUSION

Human abnormal behavior detection and analysis is still a cutting-edge field and the motion segmentation in a complex environment is a very difficult job. At present, the human behavior analysis technology is still in the elementary stage. In this paper, the experimental results are optimized under the circumstance without occlusion and shadows. How to find an algorithm which can detect and track targets accurately, rapidly and stable, which also can deal with the



complex environmental changes is still a big issue to be resolved. In the future, combined with behavioral features description, human abnormal behavior detection and analysis will play an increasingly larger role in the security system.

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**THE REVELATION FROM PERSONAL DATA PROTECTION LAW  
IMPLEMENTATION IN TAIWAN TO NETWORK  
INVESTIGATION - THE VALUE OF “CYBER MANHUNT” IN  
CRIMINAL INVESTIGATION**

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**Abstract:** “Cyber Manhunt” engine means that people refine the information provided by other searching engines, and in other words, it is like knowledge searching, through others searching something you can not find by yourself. It is indeed a mutual searching. “Cyber Manhunt” engine can reveal the fact quickly, set the moral orientation for the people and even touch the field outside the network. It is a free and nonstandard but effective internet searching engine. The paper aims to show the value and the prospect of using the “Cyber Manhunt” engine for the criminal investigation, and the “Cyber Manhunt” should be turned into a standard and effective internet criminal investigation way?.

**Keywords:** Cyber Manhunt engine, Criminal investigation, Network Public Security Department

### INTRODUCTORY REMARKS

In October 2012, Taiwan “personal information protection law” took effect<sup>[1]</sup>. According to this provision, “Cyber Manhunt” personal data based on the public interest demand becomes legal. This legislation provides a new idea for the Chinese public security.

The 21st century has become the information age. Especially with the rapid development of computer and network technology, information industry has become the most developing potential and the most prospective industry, and the high ground that all walks of life try to seize. It not only revolutionized the people’s way of life, but also changed the way humans understand the world and the way of working. It also changed the criminal investigation methods. “Cyber Manhunt” engine first appeared in 2001’s “MOP NET.” It means using modern information technology to turn the traditional Web searching into question-answer searching.<sup>[2]</sup> It is a kind of question-answer network communication activities. It turns the boring question process into personalizing question process. If the answer were accepted by the asker, it means your answer is the most useful, and the asker will give the responder MP (a kind of virtual currency) he promised in the poster as a reward. “Cyber manhunt” means a mechanism that the netizens spontaneously participated in the search of the particular characters, events, a background of some information and related information, then verified each of them and published on the Internet. Nowadays besides “MOP NET” there are other similar network stations for “Cyber manhunt”, and even the special one <http://www.ren-rou.com>. There is a sentence in China “If you love somebody, post his name on the “Cyber manhunt” network station, then you will know everything about him; if you hate somebody, post his name on the “Cyber manhunt” network station too, then you will bring him to the hell.” “Cyber manhunt” engine wandering between law and morality is a double-edged sword to the society. It promoted the social justice and moral, and it had brought a considerable negative impact to the society as well. It can find a missing person overnight, and it can ruin somebody’s reputation as well.

With the impact of information technology increase, the crime occur complex, dynamic and varied in social transformation; for the purposes of public security criminal investigation, the

1 [1] Wang, Jinping, Criminal Law and The Privacy ,2012

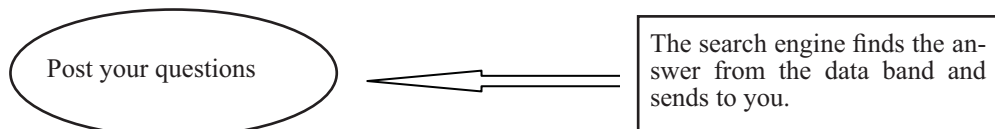
2 [2] Chuck Easttom, Jeff Taylor Computer Crime, Investigation, and the Law, 2010

traditional crime-fighting mode presents a significant lag and non-adaptive condition. Investigation departments all over the country have seen the broad prospects for development of information technology, and have gradually changed their ideas on the basis of the existed achievements and continuously explored in the criminal investigation. And this development of the introduction and regulation of “new mechanisms”-“Cyber manhunt” engine- should be widely used in public security in the network criminal investigation.

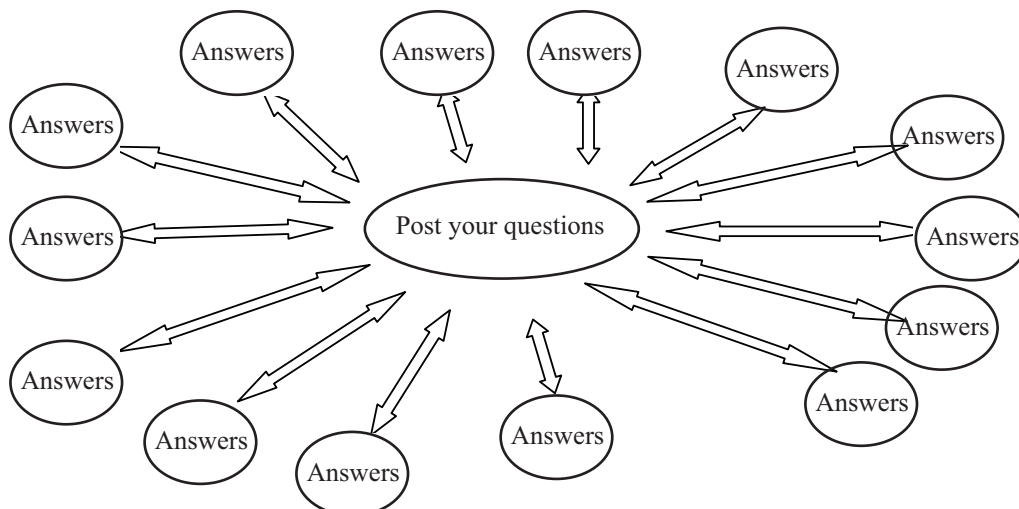
### ESSENTIAL MEANING OF “CYBER MANHUNT”

“Cyber manhunt” engine is different from the machine searching engine (that is commonly used by Chinese Internet users, search engines such as Baidu, Google); it is another way to search for information. The machine searching is not personalized, judging on the current computer technology, and computer cannot simulate the real human thinking structure. It mainly refers to a way to centralize many Internet users’ power to search for information and resources, a way to gather information including the use of machines with Internet search engines and use all the resources available to Internet users in their daily lives.<sup>3[3]</sup> Generally speaking, is reality people raised questions through the network, and the internet users who know this kind of knowledge or clues answer, analyze and help them deal with the difficulties or problems. Therefore, we can also take it as a “questions and answers” Web search; it is new resources in 21st century network in the information age. Most of the computer talents are fond of this kind of search engine for its strong pertinence and question-answer continuity.

General search engines: the question-answer method is unidirectional. It means you can get the information from the data bank only once. You can not make the interaction with the machine.



Cyber manhunt: the Question-answer method is bidirectional. It means you can get the information from different person, organizations and data banks, and filter the useful ones, then send the clues again to different person, organizations and data banks. You can make the interaction with others. This kind of process goes round and round, then you will get the exact answers.



3 [3] Altman, I. The environment and social behavior: Privacy, personal space, territory, crowding. 1975

### THE “CYBER MANHUNT” INVESTIGATIVE VALUE

There are other hills whose stones are good for working jade. Future criminal investigations should be created by using computer networks for information queries, pass-through, online investigative activities carried out, it is the only way to truly embody “intensify the police by technology and assist the criminal investigation by intelligence”, the modern investigative advantage.<sup>[4]</sup> So here takes the “Cyber manhunt” engine investigation mechanism as the most value and significance criminal investigation.

- The “cyber manhunt” engine plays significant role in the public security work in the intelligence information gathering

An indistinct photo, a fuzzy video, even a simple internet name, once they were under the “network wanted”, there would be countless Internet users involved in searching their true identities and privacy information from different sources in all directions of “blanket search”, like a jigsaw puzzle, a variety of information in a complementary and comprehensive integration. Within a few days or even a few hours, the address, phone, work units, and relatives of a realistic man and other related detailed information can be completely “Searched”. If such efficient search can not be introduced to the detection mechanism, it is a waste of resources, isn’t it. On the other hand, the “Cyber manhunt”, a network activity, makes thousands or even millions of the people involve, mobilize the broad masses of the people participation and supervision of public events. People can spontaneously crusade against the unfair network or a shameful act. The popular of “cyber manhunt” marks the modern citizens’ consciousness and mature. Therefore, the folk “network criminal investigation activities, “cyber manhunt”, not only do bring a positive and practical significance to the intelligence gathering and processing work of the public security organs but also bring more long-term social significance to the society.

- The value of “Cyber manhunt” in tracking fugitives

In tracing fugitives, the criminal investigation department always went it alone, followed the fugitives nationwide which ran high cost and low efficiency. Nowadays, network tracing fugitives in the public security organs in fact, refers to the provincial and municipal public security network linkage applications, network resources sharing, a small-scale, simple “cyber manhunt”. However, even using such a small range of network information transfer technology has also succeeded in arresting hundreds of suspects, especially in cases of hit and run, mobile criminals, as well as inter-provincial collaboration of the various police achieved significant results in tracking fugitives. For examples: statistics of Xi’an traffic police detachment on the hit and run case tracing: Since 2009, the analysis of traffic police department found that one significant feature is nearly 30% to 40% Traffic Accident cases were solved through the masses’ clues directly or assistance. Captain Zhou pointed out, the masses reported or assisted by two ways, one is providing the vehicle license plate number directly to the public security organs; another is according to the traffic police issues or from the news media channels to get the case and inform the police the accident suspect vehicles or drivers.<sup>[5]</sup> Trace the vagabond offenders. October 26, 2008, Sujiatun District, Shenyang City (a city in the northeast of China), Liaoning Province victim Lei, his wife and daughter-in-law were killed at home. The police set up a task force rapidly to visit and search, then locked lee as the suspect. According to the information in the process of arresting Lee, the police use of network information resources, pay close attention to its activities track through the network, after nearly ten months of work, in Lulong City (a city in the northwest of China), Hebei Province, on August 24, 2008 arrested the suspect Lee 2006 Shenyang Municipal Public Security Bureau Narcotics detachment received the Ministry of Public Security Command to solve the border areas Yanji (a city in the northeast of China) transnational drug trafficking case coded “703”. Five provinces, seven cities, the U.S. and the Korea cooperated, and relevant information interaction mechanism successfully used and quickly arrested 28 suspects, seized ice 3.4 kg, detained 8 involved vehicles, 1 imitation “64” style pistol, 15 bullets, 1 ball gun.<sup>[6]</sup>

In summary, the use of network information technology can greatly reduce the criminal investigation cost, improve the solving crimes efficiency. But nowadays only the public security personnel take part in the network fugitives tracing. The so called network is also confined to the public security network, while the lack of network resources and manpower shortage is the biggest obstacle to network fugitives tracing. If the application of “cyber manhunt” were imple-

mented by the public security organs to use for the network fugitives tracing, its effect will be obvious<sup>[7]</sup>. First, millions of Internet users know well more network resources than the network police, and there are some many Internet experts in the masses, we should not overlook their ability to control the network knowledge and resources. Secondly, the hundreds of millions or even more than billions of Internet users distributed all over the world compare with mere millions of police officers, the base was so large. Regardless of the suspects hiding in the mountains or cities and even migrated overseas, today human civilization reach everywhere, and there will be Internet users; so dose the suspect's information. Make full use of scientific and technological information to carry out a comprehensive scientific and technological means to track the fugitives, and maximize to gain the fugitive's information and the work efficiency, network criminal investigation showing its high value.

- Search for missing persons and unidentified bodies

“Cyber manhunt” provides information for criminal investigation and tracking fugitives, as well for missing persons and unidentified bodies and helps the public security organs to solve some practical problems. Nowadays search for missing persons and track the unidentified bodies is also difficult problem for the public security organs, the local police had to call on from one apartment to another apartment, that is time-consuming and laborious.<sup>[8]</sup> Sometimes a group of police can only visit no more than ten families in one day, the work efficiency is very low; furthermore, it is limited for mankind visiting, even if the whole region (county) police force were all involved, can only be confined to a specific region, it is impossible to a different province or the whole country, and that approach is not realistic. But we can see that the police visiting are actually the offline “Cyber manhunt” process.<sup>[9]</sup> For example: June 18, 2006, Zhumadian City (a city in the northwest of China), Henan Province an unknown body was found. The public security organs collected clues through the network and the media from the masses, eventually identified the body, according to a report from the masses, and solved the case arrested the suspects. Therefore, the application of “Cyber manhunt” in the public security can save a lot of time and police force in finding the missing persons and unidentified bodies.

## **THE INTEGRATION OF “CYBER MANHUNT” WITH THE ONLINE PUBLIC SECURITY MECHANISM**

In recent years, the Criminal Investigation reform of the national public security organs kept up with the time, carried by the “Golden Shield Project”, strengthened the public security information constructions, and already built eight public security information data banks, such as the country's population basic information banks. And relying on the information system, and carry out “online combat” actively. And criminal investigation patterns changed greatly. Nowadays different the police forces and departments relying on the fugitives information systems search for the escaped prisoners. It is reported that, in 2006, 28 million online fugitives were arrested across the country. Average 1,000 online fugitives were arrested daily in 2007. In the information age, the efficiency and impact of online combat is obvious. Order to improve the alarm, case handling efficiency, March 1, 2009, online public security organs launched officially in Shenyang. The start of the network platform, provide the technical support for the public security organs network criminal investigation implement. Shenyang public security bureau chief Wenyou Xu pointed out:” The opening of this online service platform maximized the convenience of the public, as much as possible to save time and work act cost to increase the public's right to information of public security work, supervisory powers and the right to participate, will significantly reduce management costs, improve the quality and efficiency of public security administrative services “.

With the launch of the “Network public security bureau”, online security service platform maturing, grassroots police analyze the case in practice through the network platform deeply, collect online information comprehensively, combine and compare the cases features with others online and make early warning command line publishing. All kinds of police force collaborate online and make interaction criminal investigation, objective and accurate implementation of the cases combination and comparison. Truly establish the concept of “intelligence information led the criminal investigation”, maximize relying on all kinds of criminal investigation infor-

mation systems, public security system and various social information resources, and carry out online visit actively, online combining and comparing cases, online check, online arrest, online regulation and control, online stolen goods control and other new network tactics. Meanwhile, in the local public security net, the criminal suspects' wanted--"cyber manhunt" was issued, for the people who participate in the search or provide the effective information will get material rewards. "Cyber manhunt" as part of public security organs online criminal investigation, the public security organ will take advantage of it, leaving no room for criminals to escape. And at the same time, a large number of Internet users and even victims can also participate in the public security organ's investigation through Internet (Some victims are reluctant to provide information to the public security organs face to face, then they can provide a suspect's information on the Internet, identify the suspects through the network). Ensure the safety of informants. For example, April 12, 2009, Shenyang (a city in northeast China) Sujiatun District "No.100" series car robberies were happened, more than 10 influential series of cases, the police force get clues through an online search of the city and, successfully solved it. It proves that the network platform for enhancing the working efficiency of the public security organs is increasingly significant.

### NORMATIVE BEHAVIOR FOR "CYBER MANHUNT"

Dialectical materialism believes that everything has its two sides. As a rule of law society, we must also be aware that any rights are accompanied by obligations; any free come with a responsibility. The premise of the freedom of speech is not to the detriment of the other citizens' legal rights, especially the right of privacy and reputation.<sup>4[10]</sup> Therefore, the "virtual" feature of "cyber manhunt" will have a serious negative effect. For example: the night of October 22, 2008, Henan Province Xinxiang City (a city in the center of China), a Performance Academy freshman girl from Sichuan Province was stabbed several times by her former boyfriend and died on the spot. It is reported that the murderer can not accept the fact of break up with the girl; he said the girl was ingratitude, and cheated the internet users to "cyber manhunt" for his girlfriend. The murder occurred, the truth was clear; all the internet users have remorse "do evil" behavior. It is caused by the "cyber manhunt" which should not happen. If the public security organs involved in this "cyber manhunt" event, monitored or telephoned the content and purpose of network search, or even to verify the situation when necessary, then the bloodshed perhaps will be avoided. Therefore, the rational use of "cyber manhunt", carry out rational monitoring or criminal investigation on the large-scale nongovernmental network criminal investigation is necessary responsibilities of the public security organs to safeguard the citizens' personal, honorary safety.<sup>[11]</sup> It involves regulatory problems of the public security organs to the "cyber manhunt".

The public security organs should involve in the "Cyber manhunt", supervise the search regions, and regulate the behaviors in the Internet. Ensure that the search should meet the following conditions:

First, standard the "Cyber manhunt" search contents, the "Cyber manhunt" search contents should be law-abiding, search information security, and more altruistic information search or intellectual search. Such as, post a computer program design to seek the help of others; post a problem of knowledge or the why question; post the lost and found information for the owner of lost property; post a missing person advertisement and so on.

Second, the "Cyber manhunt" should be moral, not to participate in other's privacy. The society or the government should play an effort to protect the exposure of innocent others' privacy, not to publish another's privacy in public places; (except the involving corruption and evil punishment which is bad social negative influence). At the same time, the real identity of the netizens is the basis of the network exchange, the real identity will greatly enhance the credibility of the information, and the netizens will also relatively be responsible for their own comments.

Third, strictly follow the approval procedures, to prevent the "human flesh search" abused. The public organ should develop appropriate regulations for the online publishing "Cyber manhunt" information to restrict it and exam the contents of the "Cyber manhunt", make true the information and authenticity of the website and the users. The "Cyber manhunt" having many

4 [4] Marion, Levy. Jr. *Modernization and Societies*. . 1966



advantages, but the frequent use of “Cyber manhunt”, will produce excessive citizens’ social instability and insecurity, cause panic in the community. And at the same time the frequency let internet users generate mental fatigue and numbness, reduce the “Cyber manhunt” concerns degree, and decrease the “Cyber manhunt” function. All in all, “Cyber manhunt” can only be used in the absolutely necessary situations.

Forth, the public security organs should accept the corresponding real network evidence as evidence to file the case, and open to the broad masses, be public and fair. And make sure what kind of suspects’ information can be published online, what can not; if the suspect was a minor, there should have some special precautions; the post information should be unified, with a number, with the official seal, and the real name of the office who examined and verified the information and so on.

Last but not least, “Cyber manhunt” end stage, the criminal investigation department shall promptly notify the internet users and thank them, and delete all of the posts, then stop the “Cyber manhunt.”<sup>[12]</sup>

“Cyber manhunt” would invasive other’s privacy to a certain extent, sometimes even invasive the innocent privacy, so we had better confine the “Cyber manhunt” warrant to public security website. However, internet users can browse the content freely, when the suspects saw hundreds or even thousands of criminal information of him, the information is a kind of psychological deterrent for him, and his psychological defense would crumble, and surrender.

## CONCLUSION

In summary, the “cyber manhunt” engine has affected the life and production of the human society deeply. “Cyber manhunt” this new network thinking could provide important information for the criminal investigation, useful for gathering intelligence and network tracking fugitives, missing persons and so on, save a lot of police force for the public security organs. The “Cyber manhunt” criminal investigation is the use of network information technology, posting the time of incidence, the place of incidence, characteristics of suspects and other related facts by the criminal investigation department, and then these users send back the criminal clues by its own mastered circumstances of the case, to participate in feedback in a circle process.<sup>5[13]</sup> With the help of network monitoring and other departments, the criminal investigation department commenced to distinguish and screen the Internet users’ clues, to tease out valuable clues and eventually locate the reality of the natural person. Online tactics has been universal applied in the different kinds of police force in the national public security organs, and it becomes an important part of the detective work. Investigative modes have changed from single ones to multiples; our investigators only need click the mouse to investigate the cases. Realize “technology police training and intelligence detection” truly; provide production and life safety protection for the majority of our people.

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## A STUDY ON THE USE OF A FULL SPECTRUM CCD SYSTEM TO SHOW FINGERPRINTS ON THE SURFACE OF LEAVES

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**Abstract:** A Full-Spectrum Material Evidence Identification CCD System can take photographs using the 200-1200nm spectrum, including the ultraviolet, infrared and visible light regions. The object of our experiment is to extract fingerprints on leaves by using a full spectrum CCD system, summarize the extraction techniques and provide a reference for potential fingerprint extraction.<sup>1</sup>The method utilize short wave ultraviolet camera optical conditions for extracting potential leaf fingerprints, and analyze the compaction test results. The results showed that the best way to illuminate the leaves is achieved by a reasonable light distribution background and extraction method of fingerprints. It is concluded that the full spectrum CCD photographic method can be used to extract a fingerprint from a moderately smooth leaf, effectively eliminating background noise, and increasing the brightness of the fingerprint and the background contrast, achieving the goal of nondestructive extraction.

**Keywords:** Full spectrum CCD system; all band CCD system; leaves; Potential fingerprints; Nondestructive extraction

### INTRODUCTION OF FULL SPECTRUM CCD SYSTEM

The all band CCD (charge-coupled device) system (FULL SPECTRUM CCD SYSTEM) was first developed in the United States and initially applied in aerospace and military science and technology. The equipment is mainly used to extend exposure time and reduce noise under conditions of low illumination to obtain a clearer image, as well as to reduce the interference of the background. The device is currently one of the most advanced photographic tools. In 2001, after careful research and demonstration, the Ministry of Public Security Material Evidence Identification Center took the lead in the introduction of the equipment in China. It is mainly used in finding faint trace evidence, and has been named as the all band material evidence CCD system. Special photography, used at present to extract potentially important material evidence, includes infrared photography, ultraviolet cameras, light and polarized light photographic cameras.<sup>2</sup>Different methods use different equipment, including multiband light, ultraviolet imager, infrared imager, ultraviolet light, infrared light, polarized light photography lights, and all kinds of wavelength filters. Operation of such equipment is of varied complexity. Aiming to solve this problem, the all band CCD evidence inspection system is introduced into public security criminal photos. In addition to receiving 400-700 nm visible light that human eye can see, it can also receive the less than 400 nm UV light and more than 700 nm infrared light of CCD. Therefore, the use of the all band CCD system can carry out 6 kinds of photography: shortwave ultraviolet reflection photography, long wave ultraviolet reflection photography, fluorescence photography, visible light photography, infrared reflex photography and infrared photography. Due to the complexity of the all band CCD sensor manufacturing process (at the present time we can only rely on imported products), low yield and high cost, this device is mainly applied in the military, biological research, astronomical observations and other fields. Common civil-used CCD, having adopted the standard full frame transfer CCD and polycrystalline silicon electrode, absorbs a lot of light, especially in the shorter wavelength UV spectrum area. Therefore ordinary digital cameras cannot be applied to basic material evidence ultraviolet photography. Because the all band CCD material evidence examination system can immediately formulate images, the angle of light distribution can be adjusted according to the contrast. Photographic records of the image can also be used to adjust the brightness and contrast on the computer and then print directly, avoiding the film developing process such as printing, and improving work efficiency. Photographing time is 10 minutes and post processing time between 5 and 10 minutes.

<sup>1</sup> Zhang Shujie, Zhang Chunliang. Trace Verification Volume of Chinese Criminal Science and Technique Collection [M]. People's Public Security University of China Press.2004

<sup>2</sup> Su Weifeng. Training Tutorial of Criminal Image and Video Technique [M]. People's Public Security University of China Press.2010

## MAIN CATEGORIES OF ALL SPECTRUM CCD SYSTEM

At present there are two main ways to categorize all band CCD. Firstly, they can be categorized according to cooling; it is divided into refrigerated and non-refrigerated types. Refrigerated CCD is a way to reduce electronic noise. It is suitable for a low illumination, dark field environment; it requires a long exposure and at present is mainly used in space to photograph stars.<sup>3</sup>Theoretically speaking, when the refrigeration temperature is lower, it can capture more distant stars. But with the development of refrigeration all band CCD began to be applied to criminal investigations. Non-refrigerated CCD signals can be strengthened by the CCD spectral range within 200 nm to 1000 nm, not through refrigeration, but through the strengthening of ambient light, so as to improve the signal to noise ratio of the system. However, because of the inconvenience of refrigeration, the all band CCD refrigeration type material evidence inspection system cannot be adapted to the operation requirements of a variety of environments, although the cost of the refrigeration type all band CCD evidence inspection system is low. Secondly, they can be categorized according to the types of control. They can be divided into a computer controlled system and a portable real-time observation system. The computer controlled all band CCD system must use computer software through an external video monitor. When clearly focused, adjusting the parameters allows the best image to be obtained. Because of this all band CCD controller feedback the image displayed on the monitor will lag and a lot of time is required to repeat the process: on the scene this can be very complicated. The use of the portable type real-time observation all band CCD system is similar to an ordinary SLR digital camera, which can also conveniently connect to a computer to do real-time data transmission. Three representative domestic and foreign all band CCD material evidence examination systems are chosen for comparison and interpretation: A) Domestic, non-refrigerated portable real-time system; B) Imported, non-refrigerated computer controlled system; C) Imported, refrigerated computer controlled.<sup>4</sup>If the CCD response wavelength range is wider, more kinds of photography can be selected. In addition to response wavelength range, more important is to look at whether the CCD in the corresponding light response degree can reach a maximum, corresponding to 254 nm, 365 nm in UV photography; 430 nm, 490 nm, 530 nm commonly used in fluorescence photography; 700 nm to 900 nm commonly used in infrared photography, etc. But in general, shooting light wavelengths should be higher than 50% of the response. Traditional back band according to the type of CCD in the process of taking pictures, especially over long periods of time, CCD components will become hot producing thermal noise which will influence photographic results. But a new type of all band CCD requires no additional refrigeration equipment, greatly reducing the size of the camera system, making it more convenient for use on scene. Also problems during the sealing process breaking of the vacuum can render the CCD system unusable. Image resolution determines the level of detail and clarity.<sup>5</sup>

## TECHNICAL CHARACTERISTICS OF THE ALL BAND CCD SYSTEM

**Sensitive band width:** All band material evidence examination CCD system spectral sensitivity in the range of 200 nm to 1200 nm ultraviolet, visible light, infrared photography etc;

**High resolution:** Because of the gap between its high resolution and the film, the imaging quality of an old-fashioned digital camera is not high, so rarely can be applied in examining trace evidence. The all band CCD system using back lighting and refrigeration technology, with a 1340\*1300 resolution and a set of 1 inch enlarged fingerprint images do not show sweat pores, but fingerprint lines are visible meeting the needs of the inspection photo for material evidence.<sup>6</sup>As it can be used for large-area imaging examination, this equipment meets the requirements of criminal evidence photography.

**High sensitivity:** Under refrigeration conditions, the all band material evidence examination CCD system, using long exposure can effectively reduce noise interference. Therefore, the sys-

<sup>3</sup> Zhang Shujie, Zhang Chunliang. Trace Verification Volume of Chinese Criminal Science and Technique Collection [M]. People's Public Security University of China Press.2004

<sup>4</sup> Pan Guoguang. Criminal Photography Tutorial [M]. People's Public Security University of China Press.2002

<sup>5</sup> Su Weifeng. Training Tutorial of Criminal Image and Video Technique [M]. People's Public Security University of China Press.2010

<sup>6</sup> Pan Guoguang. Criminal Photography Tutorial [M]. People's Public Security University of China Press.2002

tem has a very high sensitivity. In the case of very weak fingerprints, using the ordinary camera, even with a long exposure time, it was often difficult to make fingerprints appear effectively. With all band CCD, extending the exposure time, fingerprint become clearer. The all band CCD system is sensitive even to weak signals.

High efficiency: The all band CCD system can find all sorts of trace evidence, in addition to the light distribution and focus, images can be shown "real time" on computer monitors allowing different wavelengths to be analyzed. For ultraviolet and infrared photography, because images can be seen "real time", one can adjust the angle of light distribution according to the strength of the contrast, avoiding poor quality images. Brightness and contrast can be adjusted on the computer and the images then printed out directly, greatly improving the work efficiency. Also, the higher the number of CCD photosensitive pixels, the clearer the fingerprints are. Especially for fingerprint images, when low resolution pictures are enlarged the "saw-tooth" phenomenon can appear, influencing image quality all band CCD material evidence inspection system can be equipped with a lens and filter according as needed.<sup>7</sup> The camera and color filter quality directly determines the image quality. Focusing is a key in determining whether rapid real-time observation can improve work efficiency. If a large amount of computer processing times is required after focusing, the system will not be conducive to real-time observation. Metering is an important parameter exposure to avoid mistakes in the processing of photographs. With old-fashioned ultraviolet camera systems, exposure time must be determined by experience. If the exposure is incorrect, the process must repeat again from the beginning. If the all band CCD material evidence examination system can match with an accurate automatic metering system to determine the exposure modification and adjustment, accurate exposure can be achieved for the target object, reducing the likelihood of repeat work. As the exposure time of the all band CCD system becomes longer, the operation becomes better. Because the photography in the non-visible region requires a longer exposure time, each picture is shot for more than a second. Under particularly weak light conditions, special photography often needs an even longer exposure time (more than 10 s) to record the microscopic features of fingerprints. So, exposure time must meet the requirements of corresponding parameters.

## APPLICATION OF ALL BAND CCD SYSTEM IN THE FIELD OF CRIMINAL JUSTICE

### Search for trace evidence

Currently, physical and chemical approaches are commonly used in the field for finding marks of evidence.<sup>8</sup> For fingerprints left with sweat, a UV light can be used to make the fingerprints visible. Comparatively speaking, the UV light source is much more portable and convenient so it can be used during photography at the scene to search for potential fingerprints. However, as the resolution of such a technique is low, when it comes to particularly weak sweat fingerprints, the technique cannot produce good results. The ultraviolet system screen size is small so the screen image resolution is limited, restricting the use of the images. The limited resolution of the whole system affects the contrast between the fingerprint and background. The all band material evidence examination CCD performs at a high frequency exposure, and in a corresponding focusing preview monitor displays images, although not actually continuously. Although it is not a "real-time display" but rather punctuated, the operator can still see the image. After focusing, exposure is used to search for the fingerprint for input into the computer for observation. Because of the refrigeration system, the CCD system has high sensitivity to even very weak signals, increasing the possibility of finding trace evidence. So the all band material evidence inspection, although not as convenient as the ultraviolet system, it has the advantage of high image resolution, and is conducive to searching in a large area, where the rate of success is high. In the search for other trace evidence, such as blood on fabric or residue from shootings, infrared is most commonly used. As infrared light is not visible it also needs to be changed into something that is visible. Currently, tools for converting infrared images into visible images mainly include infrared image converter tubes, infrared cameras, etc. The use of infrared image transforms tube, the infrared camera to infrared image real-time display has the advantages of low cost and ease of use, but the image reso-

<sup>7</sup> Zhuang Hua, Huang Zhiming. Dichroism Polarization Photography by Digital Camera [J]. Criminal Technology, 2005 (2)

<sup>8</sup> Shuhui GAO. Digital red ultraviolet photographic extract potential on a smooth object refers to Lines of the comparison research [J]. Journal of Xinjiang Police College, 2010.



lution is low.<sup>9</sup>Because of the response sensitivity, for some very faint trace evidence rate of success is low, but in this case, the use of the all band CCD material evidence examination search system is appropriate, due to its higher sensitivity. Therefore, the rate of success in finding faint traces is higher. For example, in a case in Shandong the garment of one suspect in a murder was suspected of having blood on it, although the exact location was not known. Because this attire was of a dark color, it was difficult to locate. Finally, the all band CCD material evidence examination system was employed, finding blood in parts, paving the way for the resolution of the case.

#### **Lighting conditions for showing potential fingerprints**

During non-visible light wave photography, such as ultraviolet reflection and infrared reflection photography, because of different levels of light reflection and absorption, different objects will be illuminated differently. Therefore, different lighting, particularly the angle of the light, is required for different kinds of objects. As the all band CCD system effectively shows the contrast between objects and background in real time, the angle of light can be adjusted appropriately in order to improve the contrast.

#### **The role of the all band CCD system in showing fingerprints**

The methods of using all band CCD system for revealing fingerprint include: Grazing incidence, Color separation and fluorescence photographic method. Under natural light conditions, trace evidence can be difficult to see, but fluorescence photography with the CCD system is particularly appropriate. With blue and green light irradiation for examination, put on an orange filter in front of the camera lens and to receive orange fluorescence fingerprint on object.<sup>10</sup> For some other stamp-pad ink fingerprints, appeared with fluorescence photographic method, if the fingerprint contains strong fluorescence and use ordinary camera appeared high brightness, it will blur whole fingerprint. So All spectrum CCD system adjust the brightness of fingerprint and the contrast between fingerprint dermal ridge and its background.

#### **The role of all band CCD system in recording footprints**

Recording of footprints is one of the most important tasks in an inquest. Optical methods mainly include the grading method, color separation, polarized light photography and ultraviolet reflection photograph. Compared to an ordinary camera, the all band CCD system is faster with more effective results, especially for ultraviolet reflection photography. For example: for some of the more complex backgrounds of dust footprints, the interference of the background can be eliminated. Generally ultraviolet reflection photographic method and grazing incidence of light distribution will be applied. If it is a big footprint, an ordinary camera generally requires 15 to 30 minutes of exposure time and exposure is not homogenous. The all band CCD system can effectively overcome this problem with overexposure and underexposure of nearby and far away from the UV light. The all band CCD system uses only 1-5 minutes of processing time and ensures that different parts of the footprint are exposed evenly.<sup>11</sup>

### **The application of all band CCD system in document inspection and criminal photography**

The all band CCD system is widely used in document inspection. Combined with different optical methods it can identify the authenticity of a file effectively even if the writing is on dark colored material, the handwriting is blurred or altered etc. Visible, UV and IR light are used when carrying out this work.

#### **The application of all band CCD system in digital criminal photography**

The all band CCD system is beneficial to digital criminal photography; it directly outputs

<sup>9</sup> Zhou Baoli. Physical Evidence Verification Photography [M]. Beijing Policeman Education Press, 1999

<sup>10</sup> Zhang Shujie, Zhang Chunliang. Trace Verification Volume of Chinese Criminal Science and Technique Collection [M]. People's Public Security University of China Press, 2004

<sup>11</sup> Xiaojing Sun, Jinglin. All band material evidence examination CCD system applied in the field of criminal photography. Videotechnology, 2003

digital pictures, accelerating the criminal investigation procedure. The all band CCD system has had a large impact on public security. Digital photography of material evidence at the scene of a crime has laid a foundation for the use of other digital technology.<sup>12</sup>

### THE EXPERIMENT OF APPEARING FINGERPRINTS ON THE SURFACE OF LEAVES

Nowadays a large number of crimes happened outdoor, such as rape or robbery. In such instances, leaves can often be found at the crime scene with visible fuzzy fingerprints on the surface. The conventional extraction method is very difficult to record evidence and evidence may be destroyed. The following experiment has shown that the all band CCD system can be used to extract these fingerprints in a nondestructive way, allowing the use of the material evidence.

#### Main experimental instrument

Andor within a set of refrigeration material evidence of full spectrum CCD photographic system;

Nikon D70 single-lens reflex camera (Nikon)  
Nikon AFMicro - Nikon 60 mm f/ 2.8 D lens;  
Two Multifunctional stands  
254 nm short-wave ultraviolet light of two;  
A 254 - nm short-wave ultraviolet filter;  
Several scales;  
3 Plastic gloves;  
3 pair of goggles;  
Methods of Experiment

Sample production: sweat latent fingerprints, oil latent fingerprints, latent blood fingerprints, dust, fingerprints, juice fingerprint stamps on poplar leaves, such as SiJiQing, and stick on the scale. Taking original photo of material is by using a Nikon DSLR camera under visible light. Potential fingerprints of short-wave ultraviolet extraction: exposure time of 0.5 s; The aperture is set to F5.6; Add short wave UV 254 nm filter; UV lamp light distribution angle 45°, when shooting auxiliary to blow air over the examination method, until the display in the larger fingerprint image contrast, the current image collected and saved. The extraction results are comprehensive statistics and measurement, record and shooting conditions.

#### Results and analyses of the sweat latent fingerprints on the leaves surface

##### Sweat fingerprint on leaf surface

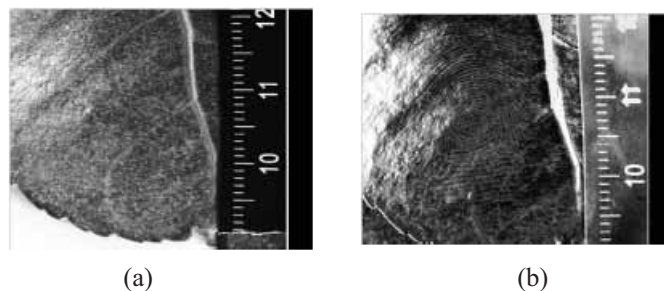


Figure 1. (a) Original appearance of fingerprint; (b) All band CCD system effects fingerprints on the leaves surface

Under visible light condition, contrast of the fingerprints on the surface and the background form is very weak, it could not reach the purpose, as shown in figure 1 (a). Materials such as sweat fingerprints under short-wave ultraviolet light, can send out long wave ultraviolet light, and shortwave ultraviolet on leaf surface has certain absorption. Sweat fingerprints on 254 nm

<sup>12</sup> Su Weifeng. Training Tutorial of Criminal Image and Video Technique [M]. People's Public Security University of China Press.2010

radiation has a diffuse reflection. Fingerprint ridge and the background formed the brightness differences, though the leaves' interference stripes to a certain extent, but it doesn't affect showing of fingerprint, as shown in figure 1 (b).

*Oil fingerprint on leaf surface*

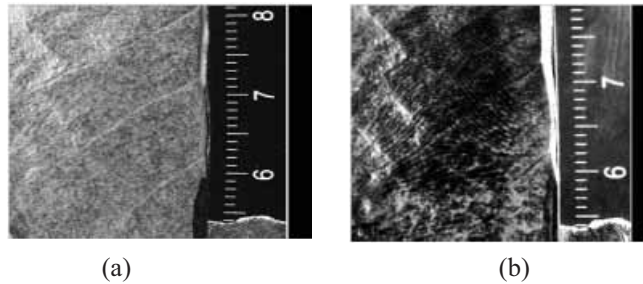


Figure2. (a) Original oil fingerprint; (b) All band CCD system effects

Effect shown in figure 2(a) demonstrate that the use of full spectrum CCD photographic system on oil fingerprints on the surface, when under 254 nm short-wave ultraviolet irradiation, can strengthen the contrast of fingerprint lines and leaves, as well as effectively eliminate the interference of the lines in certain extent. It can also adjust the contrast of the image, enhance fingerprint ridge and background contrast and make whole picture color balanced, brightness moderated with print details clearly distinguished.

*Blood fingerprint on leaf surface*

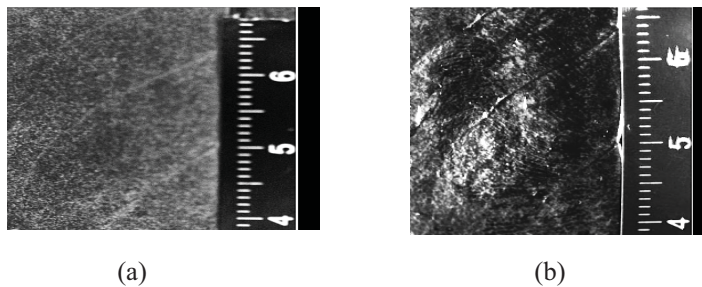


Figure3. (a) Original blood fingerprint; (b) All band CCD system effects

Latent bloodfingerprints in visible light will always be interfered with the complex background of the leaves. Contrast of ridge and background is weak so it is difficult to effectively extract fingerprint structure as shown in figure 3(a).Use of material evidence of full spectrum CCD photographic system under 254 nm short wave UV, the dark background within ultraviolet shortwave area has a strong absorption, pictures will be thin shade, and traces of blood fingerprint in shortwave irradiation of ultraviolet fluorescence is deep colored. The contrast between background and fingerprint is obvious and the final result has the highest appraisal value, as shown in figure 3(b).

*The extraction results of secretion fingerprint on leaves*

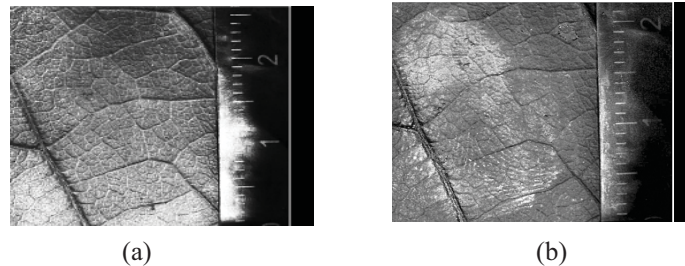


Figure 4.(a) the leaves on the fingerprint of secretion breathe;  
(b) apparent effect with breathe

Use of material evidence of full spectrum CCD photographic system under 254 nm short-wave ultraviolet irradiation, to take picture of fingerprint on the leaves, due to the poor condition gave not ideal experiment result (figure 4(a)). But we have shown that if we breathe on its surface, it can cause the difference of trace fingerprints and significantly improve the object reflective performance.

## CONCLUSION

Results of our experiment have shown that fingerprint ridge is clearly visible on the impermeable fingerprints on the leaves' surface as objects, when use full spectrum CCD photographic system under 254 nm short-wave ultraviolet irradiation. However there are some factors that may affect the result, such as the types of fingerprints, the smooth degree of leaves surface, the direction and angle of light distribution.

Due to UV has certain radiation on human skin, when applying the method of yawning, we could get a better result. Our experience is that we need to be careful about some things. Firstly, one must not breathe directly on the object surface which must not be in touch with one's skin. The correct way is to use a slightly wide straw or A4 paper to roll it as a straw. Secondly, to make sure to avoid steam bead damage to the object, keep trying on the object surface in order to get good results.

The use of material evidence of full spectrum CCD photographic system on the leaves for all kinds of potential fingerprints have very good effect. Since it is a kind of optical method and belongs to the nondestructive inspection, it can be used repeatedly without causing material damage. Even when the filmed material isn't optimal, it can be supplemented by other methods in a condition precedent to extract method before an inquest. Therefore, in the future potential trace extraction, for the potential on the impermeable object such as the leaves fingerprints, priority for extraction can be given to the material evidence of full spectrum CCD photographic system.

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## APPROACH TO CLOUD FORENSICS: CHALLENGES AND PRACTICES

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**Abstract:** With the advancement of information technology mankind has reached new frontiers in many areas of his progress. The exchange of electronic information has dramatically increased the range of possibilities concerning all kinds of communication between people. It is especially important to keep in mind that the existence of information (data) in electronic form is often used in formal i.e. official purposes, where the relevance of the electronic format is gaining momentum as a stable concept of representation of the information itself.

The methodologies concerning digital data storage and network connections have brought information technology to the advanced level of distributed computing operations, i.e. the possibility to allocate information resources by using the means of virtualization. The need to reduce computer costs (resources, referring to memory space and processing power) has led to innovation called cloud computing or the possibility to utilize computer resources that are reachable as a service via online network. Cloud computing is a technology that provides significantly better data processing as opposed to centralized data processing systems, enabling there is a higher efficiency and savings of the resources for implementation of certain computing infrastructure.

On the other side, computer forensics today is steadily establishing itself as a scientific discipline whose primary purpose is fixation and providing evidence in the form of electronic data while giving reversible reference to the genesis of found data in general. Forensic analysis of Cloud-oriented infrastructure is a challenge that inevitably transforms into standard concept striving to further strengthen the security of computer systems.

This paper aims to point out the approach to the performance of such complex digital - forensic analysis via two structural dimensions - technical performance and legal viability, as well as to determine focus areas in order to ensure the digital forensic artifacts that are of particular importance in the course of the investigation. In this sense, some results of our experience in research and practice are presented and discussed.

**Keywords:** Digital forensics, cloud computing, virtualization, network investigations.

### INTRODUCTION

The ability for computer resources and data to be organized and made available to users through so-called Cloud, has enabled significant benefits in terms of utilization of the systems concerning the time of access and the ability to manipulate the data. On the other side, the development of new and improved computer network topology caused appearance of new and improved concepts for attacks on such systems which can result in massive damages to the operation of systems in general, as well to the users. The need to locate the cause of a problem/attack, certainly is crucial in these circumstances. The transfer, the processing and the storage of data need to be controlled at any level or in any module from the operation of a particular system. Security implies a need for the ability to locate potential threats to the system, and define the problem from reversible aspect, whereby safe cloud is the primary goal.

#### **Basics of Cloud computing**

The term "Cloud" is a smaller version of the "Internet" network<sup>1</sup>, so the term "Cloud computing" can be treated as a model of information processing environment consisting of IT components (in terms of hardware, software, networks and network services) as well as processes pertaining to these components, that can represent together one autonomous system which as a resource or service can work through the Internet (Figure 1).

<sup>1</sup> Anthony T. Velte, Toby J. Velte, Ph.D., Robert Elsenpeter, "Cloud Computing: A Practical Approach", page 3, McGraw Hill, 2010



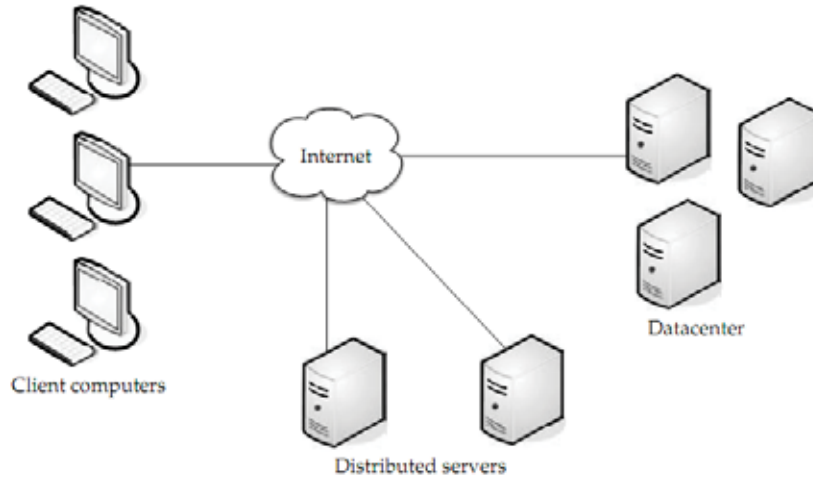


Figure 1. Three components make up a Cloud computing solution <sup>2</sup>

In this example (Figure 1) there are users (clients) connected to the cloud, that are jointly using IT resources originating from distributed application servers as well as from data centers i.e. complex databases. In this case, the applications are executed on physically separate computer systems from the same databases they use. These resources are used through internet, where the cloud actually represents a substitute for physical computing infrastructure. Resources i.e. services offered by the Cloud (Cloud services) that are usually supplied to customers through the network (Internet or private networks), depending on the performance can be interpreted as an Infrastructure (Infrastructure as a Service - IaaS) through Platform as a service (PaaS) to Application i.e. Software as a service (SaaS). This unites so called SPI (Service-Platform-Infrastructure) architecture that characterizes the cloud.

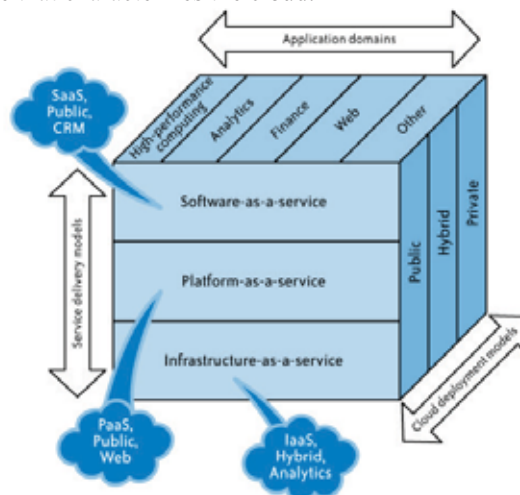


Figure 2. SPI architecture<sup>3</sup>

<sup>2</sup> Anthony T. Velte, Toby J. Velte, Ph.D., Robert Elsenpeter "Cloud Computing: A Practical Approach", page 6, Figure 1.3, McGraw Hill, 2010

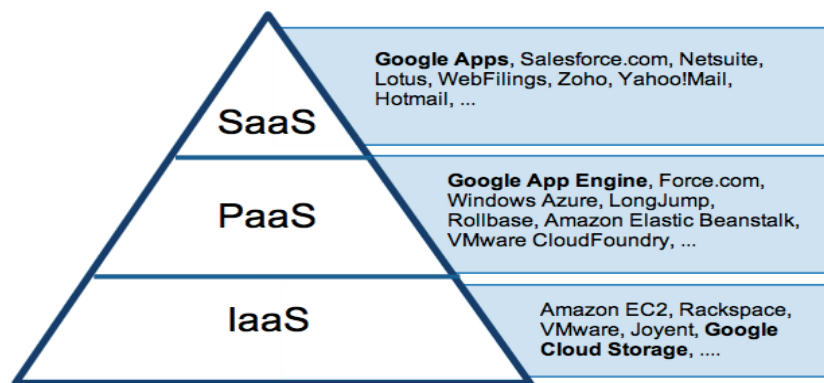
<sup>3</sup> Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy", page 11, Figure 2-3, O'Reilly, 2009

According to their purpose, as referred in Figure 2, the cloud is often applied in WEB oriented systems, systems analysis, finance, systems that require combining resources to achieve greater processing power and more. With respect to the development i.e. implementation of this architecture, the cloud can be public, private or hybrid.

#### Cloud services

Cloud services are divided into three basic types depending on their mode of operation as shown in Figure 3:

### Cloud Computing as Gartner Sees It



Source: Gartner AADI Summit Dec 2009

Figure 3. Example for Cloud services<sup>4</sup>

**Software as a Service (SaaS)** – represents the application level of functioning of the service. SaaS is basically a software developed by a third party, while it is installed and maintained by the supplier of SaaS services. End users through the network access and use the services of this service. Well-known examples are Gmail and Yahoo mail systems for electronic mail where the users have no insight into hardware and software configuration of computer systems on which they run.

**Platform as a Service (PaaS)** – represents a service where the supplier of the service provides a development environment for users who commonly develop WEB oriented applications. This model offers a development environment for which the supplier mainly guarantees for the functionality of the final programming code. Overall, PaaS should be characterized by:

Ability for independent client development and implementation of custom concept and tools

Real-time delivery of Cloud services

General operational and functional support

**Infrastructure as a Service (IaaS)** – Infrastructure as a service refers to technologies that allow performance of Cloud computing concept. The users of these services have the available infrastructure components, (databases, firewall network protection, networks and network connections, processors, etc.). In fact, IaaS is a service that provides an abstraction of the hardware potential in the eyes of the user. The supplier of this service has complete control over the hardware and software fundamentals on this level. Basic features for IaaS infrastructure are:

**Scalability** – ability to scale infrastructure requirements depending on the client needs, like processing power, working memory and memory for data storage.

**Pay as you go** – ability to pay and get exactly the required i.e. necessary infrastructure.

**The best kind of technology** – access to the best technology for a given system performance whilst complying with the cost - performance criteria.

<sup>4</sup> Google Developers Academy, What is Cloud Computing?, <https://developers.google.com/appengine/training/intro/whatiscc>, Last date of visit: 27.12.2013

**Virtualization**

Cloud services are based on the services provided via server virtualization<sup>5</sup>, where each server executes autonomous application (one or more), possesses the appropriate network connection, and supplies the proper multi-user service. Virtualization represents the cornerstone of Cloud computing concept. This allows hardware resources appropriate to be allocated to a range of applications depending on the need, resulting in increased efficiency, utilization and reduced costs. The idea of using virtualization is that the resources of a single physical computer can be divided into logical resources and converted into several virtual machines. With virtualization the complexity of the system that runs in the background is disguised and the user has no insight i.e. thinks that is working on a single resource in the execution of a particular procedure. Also, virtualization supplies a degree of isolation for certain forms of risk vulnerability. If a given system or application solution is potentially threatened by a particular hazard, the starting point for solving the problem would be to restart the virtual segment where the nested processes that occurred as a result of external influences would be completely exempt.

**NETWORK FORENSICS IN THE SERVICE OF CLOUD FORENSICS****Approach to the analysis**

Digital forensics is a generic term that is used to identify the appropriate approach to analyzing computers (their memory segments) or other digital media as well as to create reports for all the results, including the found electronic evidence and its proper interpretation for the relevant institutions.

The part of digital forensics which deals with security, study, research and documenting forensic artifacts that can be located in the network-oriented computing infrastructure or computer networks in general is called network forensics. This segment offers advanced identification of network configurations, addresses and network attributes pertaining to network adapters as well as the operating system through which they shall be used as the shape and content of the data transiting through them. In terms of attack, the possible location of the attacker is always the priority for successfully completing the activities in this area. The consequences of the attacks often may contain traces of the attacker, both in terms of its action and of its location. As basic entities in these types of analyzes two sides are taken into consideration :

- Attacked side (PCs, servers, cloud systems and other types of computer systems that have certain capabilities for network communication via a particular network interface)
- Attacking side (can be treated as IP address, network domain area, traces of activities characteristic of a particular software applications, etc.).

In general, most and almost always in the approach to defining the attacks, only the attacked side is available. It is less likely that from start the attacking side will be available for analysis i.e. through the computer system which is performed the attacking action. But not always the attacker is directly in relation with the attacked side. Some of the attacks are carried out by the so-called secondary level of existence in the network using the interceptor methods by “sniffing” network traffic where the attacker can be connected to the network device (switch, hub, router) as a network entity on the same level with other network nodes or administrative segment who has executive control over network device (rarely).

Once the weaknesses of the system are identified, based on these data specific actions should be performed, such as penetration or intrusion into a computer system, download data and changes in the memory medium of embattled system.

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<sup>5</sup> Possibility of the computer to host several independent virtual applicative or data servers.

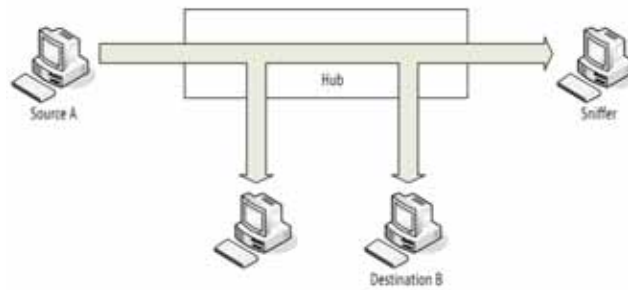


Figure 4. Hubs and monitoring<sup>6</sup>

On the other hand, network forensics can be applied in the analysis of functional network topology in so-called Live Forensic state. This approach involves scanning the entire network infrastructure, input-output traffic to all end nodes in the network as well as network configuration parameters of end nodes and of network devices that maintain the functionality of the network. As part of the methods and tools used in the practice of network forensics are: analysis of previously generated network DHCP logs; encapsulating the data segments (data dumps) as packets transferred across the network; generally monitoring the network activity for specific network adapters using Wireshark or Fiddler; parallel infiltration at the network level of network adapters and network analysis applications separately for each end node i.e. device. In this case, a thorough knowledge of the structure of network data packets is a crucial factor for the successful enforcement of forensic analysis.

**Cloud Forensics – Challenges**

As previously mentioned, data security in the cloud is of primary importance for its proper existence. Starting from this, there is a need, to define the domain area of functional procedures that could be used, which belong to the field of digital forensics i.e. network forensics that concentrates on network topologies.

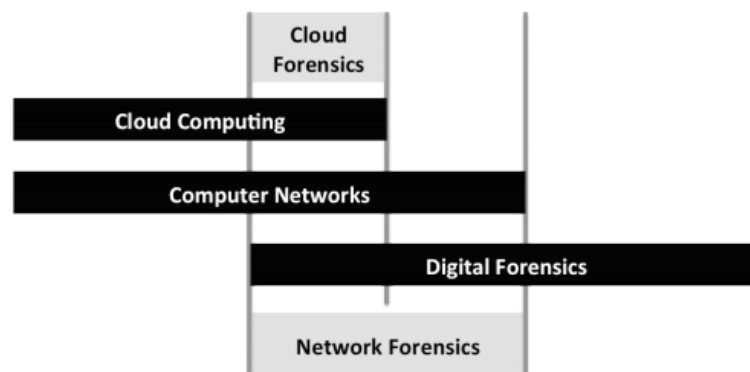


Figure 5. Where is cloud forensics?<sup>7</sup>

Cloud forensics can be defined as a cross-disciplinary concept of computer forensics and Cloud oriented systems. Normally that network forensics would be a priority aspect in defining the procedures for the analysis of the cloud. In general, the only thing that would be different in this case is the fact that network forensics should be focusing on each of the Cloud services. Guided by this, The National Institute of Standards and Technology (NIST) recommends distinction of three separate dimensions that will address the cloud forensics, or:

6 Vic (J.R.) Winkler, “Securing the Cloud, Cloud Computer Security, Techniques and Tactics”, page 49, Figure 2.10, Elsevier Inc., 2011  
 7 Keyun Ruan, Prof. Joe Carthy, Prof. Tahar Kechadi, Mark Crosbie, “Cloud Forensics: An overview”, page 2, Figure 1, Centre for Cybercrime Investigation, University College of Dublin, 2013

Technical dimension  
 Organizational dimension  
 Legal dimension

Acts that can be categorized as actions against such infrastructures require expanding the term “Computer crime”. In general, if the computer actions constitute illegal activities whose performance through the use of a computer system, in this case, the acts would involve direct implication of the Cloud. The Cloud would be the object to perform a certain act in which the service provider would be the attacked side that directly would endanger the cause of action (himself). On the other hand, the cloud is the environment in which the action takes place, given that the potential evidence may be located in any segment of system memory. This indicates that the potential reason for performing the action does not have to require client segment solely in the cloud.

#### *Technical dimension*

Technical dimension involves a set of tools and procedures that serve to perform the forensic analysis in terms of Cloud infrastructure. There are three most important segments that need to be considered in the technical dimension:

- Data collection with forensic approach - The process of retrieving data that may be of interest to the investigation is necessary to be based on the same principle as forensic acquisition of data under normal conditions, i.e. it is necessary to make a proper identification, labeling, storing and preparation of data for their further processing. In Cloud oriented network topology there are different types of data sources, both on client and server side. Of course, as every Cloud has a different concept of modeling, approach to securing data, will be different, depending on specific situation. The rule in which order would be data retrieving performed, depends primarily on their consistency (generally, the RAM data would be the first to download). Most important of all is to preserve the concept of isolating any possibility of contamination of the electronic data, or to minimize the conditions for this occurrence.

- Segregation of electronic evidence - The management is an important segment in Cloud oriented systems of hardware resources. It is very important to set the correct approach to the part where to begin with data acquisition, and try to make as little harm and instability as possible in terms of general operation of the system.

- Virtual environment analysis - In general, virtualization is a key segment in the existence of Cloud infrastructures. Ensuring data from a security aspect through virtual approach involves much more than just data encryption. Certainly, from the perspective of Cloud computing architecture, method i.e. the concept of ensuring appropriate data depends on the service and development models, as well as of tolerance in relation to the risk of attack on the system. However, the use of encryption is the starting point. In terms of data subject to manipulation in the system, their security can be considered in terms of their proper form, or:

- Transit data
- Data on standby
- Data processing, including multi-user servicing
- Origin of data
- Data inheritance tree
- Backlog of data

These are six key aspects in relation to the primary dimension of data security. The confidentiality of the system will be always directly proportional to the degree of development of security in relation to the above aspects. One thing we know for sure, is that not always are all six aspects considered, depending on the system i.e. its topology. For example, the type of data in the public cloud may require the development of enhanced security in terms of transit data, while in the private cloud that would be the case with the security of data on standby, etc. For the forensic analysis to be as efficient as possible, every cloud in its development needs to be placed in a way so that the same cloud would easily provide a high quality forensic analysis on its own (Forensic Awareness).

**Organizational dimension**

It is already concluded that a Cloud forensic analysis should be addressed in two parallel segments - the Cloud service provider (CSP) and a client of that service. In circumstances where CSP relies on additional external segments (outsourcing), the definition of "attacked side" is significantly expanding. In any case, when setting the initial approach for analysis, the effectiveness should be in the forefront. Therefore, segments that are preferred to be covered in the analysis are:

Forensic scientists - people who will adequately approach to the performance of necessary analyzes verified through advance scientific methods, principles and practical actions on both sides of the cloud. These persons should be fully familiar with the ability of "the analyzed subject" so that he can undergo a thorough forensic analysis.

IT professionals - a wide range of specialized profiles that could help with the actual approach to system infrastructure, in order to obtain a more detailed picture of the environment of the action performance. For example, unauthorized data access, malicious data loss, breach of confidentiality of the system, locate the malware etc.

Legal consultants - whose involvement in the process is invaluable in terms of proper identification and verification of found electronic evidence.

Other external associates - persons from different background, in order to get a proper picture of how the system works in detail, and what could pose a potential threat to it.

**Legal Dimension**

Undoubtedly, it is necessary to bear in mind that forensic analysis depends directly on the specific situation of the legal system laws in force. In case of a private cloud, analyzes are usually dimensioned based on legal regulations and laws applicable to entity in which the cloud exists technically functions. But what is happened if it is a public cloud whose infrastructure and user range extends across multiple justice systems (or more countries generally speaking)? If all the countries that use the cloud have the same or mutually agreed legal regulations, the possibility of complication during the analysis is smaller, but if there is a situation of a different set of laws and regulations, then the analysis of each different segment of the cloud is performed differently depending on the legal regulations in which the analyzed segment is subjected. Theoretically, this could lead to unwanted situation of occurrence of the so-called consciously isolating or inability to obtain evidence.

For this purpose, usually an agreement is established on how to use Cloud services and if necessary how one could perform an intervention or forensic analysis on it.

**Focus areas for Cloud analysis**

Having set the conditions under which the forensic analysis should be carried out on Cloud-oriented systems, it is necessary to know on what the same should focus. Certainly in different situations/topology is not guaranteed that analysis of all forensic areas is required, but it is desirable to have an idea which areas can be covered:

Investigation of certain acts committed in the cloud would be related to violation of certain rules and legal regulations, establishment of suspicious data transfers, suspicious operations, reconstruction of events as well as providing evidence in an understandable form to the relevant instances.

Locating errors would actually be determined providing information virtual as well as physical for segments in the cloud, defining the main reason for the ensuing problem / situation, locating critical events, and providing functional and operational issues, in order to properly deal with accidental situations in the Cloud. Here, of paramount importance would be performing a continuous monitoring system in general and further review of the transcripts originating from the same.

System and data reconstruction would allow the return of the data in the cloud that accidental or intentional would be deleted or modified, decrypt the encrypted data, returning the system to function after its breakdown and providing data from the cloud incurred or inserted after the specified moment of occurrence of a critical situation, and their isolation which leads to further review and verification.



In order to ensure proper performance of the conditions of cloud forensic analysis, every Cloud service provider must ensure appropriate technical conditions for performing it. The legal framework, on the other hand is another undeniable factor, whose respecting (depending on the specific situation) will provide precise definitions of the reason for the situation and the proper interpretation of the evidence before the relevant instances.

## SOME PRACTICAL RECOMMENDATIONS

### Providing network forensic artifacts

Each forensic analysis in the field of computer forensics is based on collecting of certain evidence in digital form and their proper interpretation. In order to perform a proper cloud forensic analysis, as an appropriate closest approach would be certainly the use of the methods and principles underlying network forensics. It may be considered for approximation, but not for identification. Following is the tabular overview in which network forensic methods are listed, as well as some comments of the derivative data, thus clarifying their potential ability in performing Cloud forensic analysis:

Procedure	Comments
General overview of network and monitoring.	In terms of complex network topology, in order to save resources monitoring or providing data is performed only from crucial network segments.
Unified input and output concepts regarding to data analysis.	The correct approach to data acquisition means in advance the expected form of the data to be provided, implying also a proper conduct further analysis.
Securing data from network traffic in real time and storing them properly as well as encrypted traffic analysis, also hashing and preserving information about their original location.	Many tools are capable of providing real-time data originating from network traffic, but because of the significant loss of data (packets), the consistency of these analyzes may not always be taken as relevant. Nearly always it's generated a huge amount of data in this analysis, whereas their storage is an additional problem. The need to establish end-to-end approach that would consider the factors for encrypting the data itself. For further processing it is necessary to use a unified standard (network forensic image - pcap, bin files) and ensuring validation of their electronic fingerprint.
Coping with volatility.	The fixing of the data is an important segment due to their unstable nature and frequent losses. Overcoming this problem is a timely response and increased efficiency.

System unification and standardization.	Concept implies identical configuration on all network devices for enhanced functionality. This would reduce the likelihood that the same type of data provided by various segments of the system would be interpreted differently.
Time synchronization and analysis protocols which can further provide a timeline analysis.	Time synchronization in providing data, on the other hand is the factor that ensures the uniformity of the analysis. Temporal analysis presented visually can give a huge contribution to the unveiling of the case. But in reality, it comprises most data that would be provided in general (raw) format, without system parameters.
System integration with multiple network and security tools as well as other network/cloud forensic tools.	More tools means higher probability that most of the discovered data will be interpreted accordingly.

*Table 1. Required procedural capability for vital cloud forensic analysis*

Considering the above procedures for providing and analyzing data transiting through computer networks (Cloud meaning), one may get a preview where network forensics is located compared to other segments in the cloud, as well as what it would implement in order to properly perform certain forensic analysis.

**Potential ability of forensic tools**

What should be done by a certain forensic tool in order to ensure proper forensic analysis of the cloud. There is a need to develop a tool or concept of tools that can make a successful acquisition and analysis of data across different types of network topologies, i.e. in different clouds. Whichever it is, the general tool that can make a successful forensic analysis of the cloud should include the following (Figure 6):

System infiltration and integration which can provide examination and assessment of network topology and the environment,

Continuous monitoring, based on previous capability to provide detail data interpretation and smaller probability of losing the same, and can be focused on volatile data too

**Forensic data acquisition,**

Detailed data analysis in forensic matter to extract crucial information from the “sea of information” which will be created when the acquisition is completed,

Generating forensic reports for each data that will provide a functional justification and physical location, accompanied by system attributes that apply to the same one (if during acquisition there is a possibility of providing the same ones). These reports need to be in two types - detailed and simplified form, technically understandable for both IT professionals and the other involved parties (external entities, legal entities, etc.) who do not require to possess advanced information knowledge during their professional engagement.

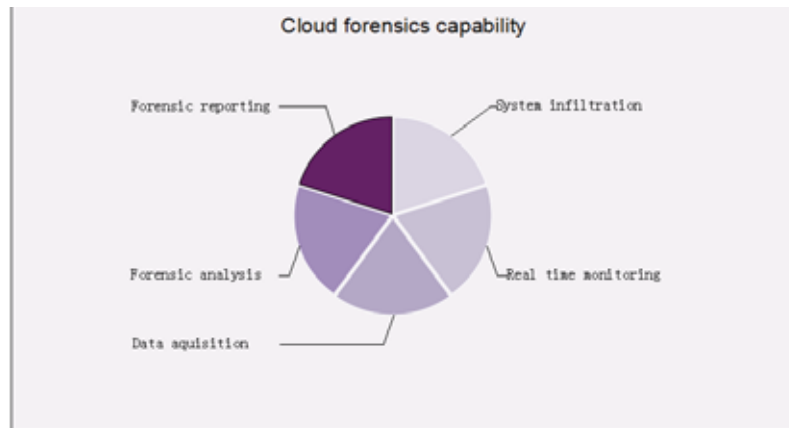


Figure 6. Schematic content of Cloud forensic tools capability

## CONCLUSION

Cloud computing is a concept that slowly but surely is imposing himself in the modern IT world. The security architecture upon which the Cloud is built or implemented is an essential element in establishing trust and confidence in this concept, which will be transformed into a potential choice for myriad future users. The possibility for a system to easier undergo adequate forensic analysis means faster transition from a centralized to a distributed model of organization in the IT infrastructure, for both unstable and stable operational conditions.

The regulated standards and legislation could greatly contribute to ensuring the smooth execution of such analyzes. Thereby when a given Cloud will be properly implemented (both from functional and secure perspective), then there is no reason of not accepting the fact that the performed analyzes would result with relevant data for securing and interpreting proper electronic evidence.

The future of Cloud forensics undoubtedly imposes a technical challenge where many desktop-oriented forensic tools and concepts will have to experience appropriate transformation, as well as to attain the ability to perform analyzes within such advanced network topologies. In this sense, some preliminary recommendations are presented showing rich potential utilization.

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**PROBLEMS OF STANDARDIZATION  
OF THE METHODS OF SOLUTION  
OF THE FORENSIC BALLISTIC TASKS**

**ПРОБЛЕМЫ СТАНДАРТИЗАЦИИ МЕТОДОВ РЕШЕНИЯ  
СУДЕБНО-БАЛЛИСТИЧЕСКИХ ЗАДАЧ**

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**Abstract:** The paper reveals problematic aspects of forensic ballistics investigations. The main problems that negate the effectiveness forensic expert's actions are the absence of united classifier of the forensic ballistic tasks in different departments and recommended and alternative methods of solution of different tasks; abstractedness of existed investigation methods that are commonly contain only the general pattern of researches; disagreement between different departments' specialists who determines the content of experts' researches in understanding of base law categories.

In order to make methodological support of forensic ballistics investigations more advanced it is suggested to make a detailed classifier of forensic ballistics tasks; to create unify methods of solution of forensic ballistics tasks, as a national standards as well; to change typical methods of tasks' solution to detailed, adapted to specific expert situations; to develop and implement methods based on quantitative evaluation of characteristics that allow to evaluate statistical reliability of conclusions; to develop the appraisal system of methods of solution of forensic ballistics tasks; to make a single approach to understanding of base law categories in particular "firearm" and "ammunition"; to correct related laws and regulations.

**Keywords:** Forensic ballistics, firearm, ammunition, methods of forensic ballistics investigations.

**ВВЕДЕНИЕ**

В ходе расследования преступлений, совершенных с применением огнестрельного оружия, значительную часть информации следователь получает в результате криминалистического исследования оружия и следов его применения (судебно-баллистической экспертизы). Выводы эксперта порой определяют дальнейшую судьбу уголовного дела – подтверждают вину подозреваемого или наоборот, становятся основанием для прекращения дела.

**СТАНДАРТИЗАЦИЯ СУДЕБНО-БАЛЛИСТИЧЕСКИХ МЕТОДОВ**

Одна из наиболее актуальных в судебной баллистике проблем на данный момент – разработка стандартных методик решения типовых задач, обеспечивающих повторяемость выводов эксперта, т.е. идентичность результатов исследований, выполненных в разных подразделениях и организациях по одинаковым объектам.

Решение задачи создания стандартных методик сопряжено с рядом объективных трудностей. Рассмотрим их подробнее.

**ОБСУЖДЕНИЕ**

Во-первых, к настоящему моменту не выработана единая для всех заинтересованных ведомств иерархическая классификация судебно-баллистических задач. Большинство экспертных исследований предполагает решение целого набора подзадач, второстепенных по отношению к основной, но не менее важных с точки зрения получения правильного

вывода. Например, в идентификационных исследованиях предварительно определяется относимость устройства к оружию, его исправность и пригодность к стрельбе, образец патрона, частью которого является пуля или гильза, его штатность, модель оружия, из которого пуля была выстрелена и т.п. Каждый из перечисленных вопросов, фактически является самостоятельной задачей, для решения которой необходима специфическая методика. Поэтому в настоящий момент укрупненные задачи типа идентификации огнестрельного оружия, решаются на основе типовых методик, которые представляют собой схематический порядок действий эксперта. Подобные типовые методики слабы, во-первых, тем, что они носят обобщенный характер и не разрешают всех возможных проблем, возникающих в ходе исследования реальных объектов, и, во-вторых, входящие в исследование подзадачи решаются разными экспертами различными способами, поскольку детальных процедур их решения в типовой методике не предусмотрено.

В качестве примера рассмотрим применяемую экспертами системы МВД методику экспертного решения вопроса об отнесении патронов к категории боеприпасов<sup>1</sup>. Основным критерием при отнесении патронов к боеприпасам является их предназначенность для поражения цели. Проверяется она путем решения двух подзадач: а) установление вида, типа и образца патрона, его штатности и б) установление принадлежности конкретного патрона к категории боеприпасов. Для заводских патронов основным требованием является наличие всех компонентов (пули, гильзы, пороха и иницирующего состава), поскольку их предназначенность предопределена техническими условиями на их изготовление. У самодельных же патронов (в том числе подвергавшихся переделке заводских), дополнительно проверяется поражающая способность снаряда, которая должна составлять не менее 0,5 Дж/мм<sup>2</sup>.

Схематичность данной методики оставляет без разрешения ряд проблемных ситуаций. К примеру, в ней отсутствуют перечисление оснований, при которых тот или иной компонент – гильза, иницирующий состав и пр. может считаться наличествующим. Если компонент перестал выполнять свою функцию в связи с дефектами, химическим превращением, коррозией и т.п. – можно ли считать его имеющимся в наличии? Каким образом следует поступить эксперту, если в ходе исследования заводского патрона выясняется, что определенный компонент по тем или иным причинам изменился, утратил свои функции и это повлекло утрату патроном своей поражающей способности?

Приведем несколько примеров, иллюстрирующих подобные ситуации.

1) Изменение пули и гильзы патрона: - механические повреждения (поперечный изгиб, разрывы или отверстия в корпусе); - коррозионные повреждения (отверстия в корпусе, увеличение размеров корпуса за счет нарастания окислов и т.п.). Механические повреждения и коррозионные изменения могут исключать возможность помещения патрона в патронник, создавать опасность для стрелка при выстреле, либо исключать возможность воспламенения пороха.

2) Изменение порохового заряда или иницирующего состава: химические превращения, приведшие к утрате способности к воспламенению, либо утрата части порохового заряда вследствие негерметичности корпуса. Вопрос о том, допустимо ли считать разложившийся пороховой заряд порохом, весьма дискуссионный.

В методике не определен порядок действий эксперта при исследовании гильзы, которую невозможно поместить в патронник либо корродировавшей и негерметичной гильзы, не регламентирован способ установления наличия пороха как компонента боеприпаса – экспериментальный отстрел, поджигание или химический анализ. Неясно, каким образом проверять наличие иницирующего состава. Отсутствуют указания на то, какие выводы делать по патронам, некоторые компоненты которых утратили свои функции. Допустима ли самостоятельная доработка экспертом патрона, например, удаление ржавчины перед экспериментальным выстрелом? Остается нерешенным также вопрос о том, следует ли учитывать природу изменений, произошедших с патроном, например, естественное оржавление или намеренную переделку конструкции.

Подобная ситуация стала возможной во многом благодаря тому, что методика, во-первых, на данный момент является слишком абстрактной, обобщенной, и, во-вторых, в одной методике сделана попытка объединить решение сразу нескольких подзадач.

<sup>1</sup> Типовая методика экспертного решения вопроса об относимости патронов к категории боеприпасов (утверждена решением Методического совета ЭКЦ МВД России от 22 мая 2008г.).

Очевидно, что разрабатывать стандартные методы и методики целесообразно в отношении конкретных задач, не предполагающих внутри решения каких либо промежуточных вопросов. Стратификация задач судебно-баллистической экспертизы является необходимым условием для разработки единых стандартных методик их решения. Задачи должны быть структурированы до элементарного, низового уровня, затем для каждой необходимо разрабатывать стандартную методику решения. В последующем отдельные методики могут быть использованы в качестве звеньев более сложной, составной методики решения типовой или напротив, нестандартной задачи. В перспективе необходимо переходить на государственные стандарты методик и методов решения судебно-баллистических типовых задач различного уровня, единые для всех ведомств, проработать систему аттестации методик.

Во-вторых, помимо разработки классификатора задач необходимо проработать вопрос о допустимых методах их решения, т.е. создать классификатор методов. Очевидно, что одна и та же задача может быть решена путем применения разных методов, оборудования и т.п. В различных ситуациях эффективны разные методы исследования. К примеру, одни методы менее точны, но сохраняют объект исследования, другие повышают точность результата, но их использование сопряжено с повреждением объекта. Таким образом, необходимо создавать иерархию или классификатор альтернативных методик и методов решения одной и той же задачи, прописывать требования к методам, систему их аттестации.

Рассмотрим в качестве примера достоинства и недостатки возможных способов решения задачи о дистанции выстрела по следам на предмете одежды.

Задача о дистанции выстрела принципиально решается путем сравнительного исследования, сущность которого заключается в сопоставлении следов выстрела на исследуемом предмете одежды с экспериментальными образцами и (или) справочными сведениями о следах выстрела с различного расстояния. В качестве справочных сведений могут быть использованы коллекции натуральных образцов, фотографии следов выстрела, а также описания, табличные и графические данные, имеющиеся в литературе.

В зависимости от того, какие признаки положены в основу сравнения – количество определенных веществ в копоти или топография, размеры и пр., различают соответственно количественный и качественный анализ.

К методам качественного анализа относится визуальное сравнительное исследование. Сущность этого способа заключается в визуальном сравнении изъятого следа с экспериментальными образцами следов выстрела из аналогичной модели оружия (натурной коллекцией), альбомами изображений таких следов или с детальными описаниями следов выстрела.

Способ визуального сравнительного исследования обладает важнейшим достоинством – простотой. Кроме того, данный способ достаточно точен при следовании следов выстрела с дистанции до 30 см. К числу же недостатков способа относится следующее.

Во-первых, отсутствие сведений о значимости для дифференциации дистанции признаков, которые можно оценить визуально. В основу определения дистанции могут быть положены признаки, которые не являются характерными только для данной дистанции или ее интервала.

Во-вторых, трудности в оценке размеров зон окопчения, их интенсивности и сравнении их со справочными данными. Зоны окопчения, как правило, имеют некруглую форму и нечеткие края, поэтому измерение их диаметра практически всегда субъективно. При сравнении с табличными данными сложно судить о том, какие именно размеры указал их составитель – максимальный, минимальный, средний, как определял внешний край зоны и т.п. Что касается интенсивности, то очевидна сложность ее единообразной оценки, поскольку шкала выбирается составителем справочных данных произвольно.

В-третьих, по двум-трем фотоснимкам следов выстрела в альбомах сложно судить о вариационности следов выстрела на определенной дистанции. Кроме того, трудно оценить – является ли интенсивность окопчения на иллюстрациях адекватной. Этот признак существенно зависит от условий фотосъемки, обработки изображения и печати альбома.

Методы количественного анализа, как правило, лишены недостатков, характерных для метода визуального сравнения.



В рамках количественного анализа дистанция определяется по количеству того или иного металла в копоти выстрела. При этом оценивается абсолютное или относительное содержание металлов. При оценке абсолютного содержания измеряется либо общее количество металла в зоне окопчения; его количество на участке определенной площади (например, в кольцевом пояске определенного диаметра) или изменение количества в кольцевых поясках разного диаметра. При оценке относительного содержания измеряется количество металла в разных кольцевых поясках зоны окопчения относительно чистого участка в процентах. Эти методы достаточно хорошо рассмотрены в литературе<sup>2</sup>.

Методами количественного анализа дистанцию можно устанавливать в диапазоне от 0 до 1,5 и более метров. Однако при выстрелах с расстояний до 20-30 см, дистанция определяется с точностью  $\pm 5-15$  см, т.е. с интервалом едва ли не более широким, чем при обычном визуальном исследовании. Связано это с тем, что на коротких дистанциях зависимость уменьшения количества металла с увеличением расстояния выстрела не выполняется. Вызвано это может быть, например, прониканием части металлов вместе с пороховыми газами сквозь ткань и отложением их на нижних слоях. Так, интенсивность металлизации как функция дистанции не может быть использована для ее установления при выстрелах из 5.6-мм пистолетов с дистанции до 5 см; 7.62-мм и 9-мм пистолетов - до 10 см; АК-47 - до 20 см<sup>3</sup>, охотничьих ружей - до 30 см.

Таким образом, методы, основанные на анализе количества того или иного металла показывают невысокую точность при исследовании следов выстрела с дистанций до 30 см.

К методам количественного анализа могут быть также отнесены способы, основанные на фотометрировании как оригинальных следов выстрела, так и контактограмм этих следов. Так, Г.М. Дружинин и А.М. Моисеев применяли машинную обработку денситограмм (функций почернения оптических моделей) следов выстрела из пистолета ПМ, полученных фотометрированием фотопластин, изображение на которых сформировано вращающимися участками окопченности<sup>4</sup>. М.А. Сонис, В.И. Фурлетов, Л.Ф. Потапова, В.П. Мажоров, О.Е. Марин определяли дистанцию выстрела измерением интегрального коэффициента отражения в контактограммах отложения металлов<sup>5</sup>.

В настоящее время появились примеры комбинированных методов определения дистанции выстрела, в частности, метод визуального сравнения усовершенствован дискриминантными функциями, полученными в ходе статистического анализа признаков следов выстрела. Применение дискриминантных функций помимо снижения субъективности исследования, позволяет решать также иные задачи. Во-первых, метод учитывает вариационность следов выстрела, связанную с особенностями разных экземпляров оружия, а также с особенностями мишеней. Во-вторых, вывод о дистанции формулируется с гарантированной надежностью (с известной вероятностью ошибки). В-третьих, для определения дистанции не требуется применения альбомов, натуральных коллекций, описаний следов и пр.

Таким образом, в настоящее время разработано достаточно много методов решения однотипных задач, каждый из которых имеет свои преимущества и недостатки. Однако рассмотренные методики, как правило, реализованы в виде научных публикаций ав-

2 М.А. Сонис, И.Н. Шлюндина Определение расстояния выстрела при стрельбе из пистолета ПМ, пулемета РПК и их модификаций с глушителем//Экспертная практика и новые методы исследования. Вып. 9. М.: ВНИИСЭ, 1991. С. 8-18; М.А. Сонис, А.М. Пчелинцев, Г.М. Полуэктова Определение дистанции выстрела из автомата Калашникова методом атомно-абсорбционной спектроскопии//Экспертная практика и новые методы исследования. Вып. 12. М.: ВНИИСЭ, 1980. С. 16-26; Методические рекомендации по судебно-баллистической экспертизе. М.: ВНИИСЭ, 1979. С. 3-15; Применение рентгенофлуоресцентного, нейтронно-активационного и атомно-абсорбционного анализа для определения дистанции выстрела, вида и калибра оружия. М., ВНИИ МВД СССР, 1981.

3 Например, при выстрелах из АК-47 среднее количество сурьмы в пробах (мкг/мл) на дистанции до 10 см отличается незначимо (5 см -  $200 \pm 9,2$ ; 10 см -  $209 \pm 42,8$ ), некоторые различия наблюдаются лишь на дистанциях до 10 см и 20 см (20 см -  $134 \pm 18,8$ ). Содержание олова и свинца на дистанциях 5, 10 и 20 см также отличается незначимо: олово - ( $91,6 \pm 33,4$ ;  $88,8 \pm 33$ ;  $55,8 \pm 14,4$ ), свинец - ( $4,1 \pm 1,1$ ;  $6,9 \pm 4,4$ ;  $2,3 \pm 1,1$ ).

4 Дружинин Г.М., Моисеев А.М. Определение расстояния близкого выстрела при стрельбе из пистолета ПМ (Методические рекомендации). М.: ВНИИСЭ, 1987.

5 Сонис М.А., Фурлетов В.И., Потапова Л.Ф., Мажоров В.П., Марин О.Е. Количественная оценка продуктов выстрела (металлов) на отбрасках с мишеней//Экспертная техника. М.: ВНИИСЭ, 1988. Вып. 100.

торов различных ведомств, единого государственного стандарта для них не существует. Назрела необходимость систематизации этих методов, создания своеобразного каталога апробированных методов, рекомендованных к применению в тех или иных экспертных ситуациях.

В-третьих, существенным препятствием в разработке стандартных методик решения судебно-баллистических задач являются различные подходы к пониманию категорий «огнестрельное оружие» и «боеприпас», которые являются предметом ряда преступлений, предусмотренных УК России. В частности, эти понятия используются в ст. 222 УК РФ «Незаконные приобретение, передача, сбыт, хранение, перевозка или ношение оружия, его основных частей, боеприпасов, взрывчатых веществ и взрывных устройств», ст. 223 УК РФ «Незаконное изготовление оружия», ст. 225 УК РФ «Ненадлежащее исполнение обязанностей по охране оружия, боеприпасов, взрывчатых веществ и взрывных устройств», ст. 226 УК РФ «Хищение либо вымогательство оружия, боеприпасов, взрывчатых веществ и взрывных устройств».

Специалисты Министерства внутренних дел РФ и Министерства юстиции РФ разошлись во мнениях о том, какие виды патронов к огнестрельному оружию (за исключением патронов к гражданскому огнестрельному гладкоствольному длинноствольному оружию) относятся к боеприпасам.

Так, специалисты Экспертно-криминалистического центра МВД России считают, что используемое в указанных статьях УК РФ понятие «боеприпас» включает патроны к любому виду огнестрельного оружия – гражданскому, служебному и боевому. Специалисты же Российского федерального центра судебной экспертизы Министерства юстиции РФ считают, что к боеприпасам в контексте данных статей УК РФ относятся только патроны к боевому огнестрельному оружию, а патроны к гражданскому и служебному оружию боеприпасами не являются. Свою позицию специалисты Министерства юстиции РФ мотивируют содержанием ГОСТ 20313-74, в котором боеприпасы называются «изделиями военной техники». На этом основании эксперты указанного ведомства считают, что «боеприпас» - это военное понятие и к ним относятся только патроны к боевому огнестрельному оружию.

В результате различия подходов к пониманию категории «боеприпас», выводы экспертов по одним и тем же объектам нередко бывают противоположны. Например, 5,6-мм патрон кольцевого воспламенения (.22 long rifle) в экспертных учреждениях системы Министерства внутренних дел России признается боеприпасом, а экспертами Министерства юстиции России нет.

Попытки решения возникших разночтений пока не увенчались успехом. На заседаниях Федерального межведомственного координационно-методического совета между представителями заинтересованных ведомств была достигнута договоренность о необходимости уточнения понятия «боеприпас» в УК РФ. Однако относительно содержания этого уточнения не удалось договориться. Так, специалисты ЭКЦ МВД РФ предлагают включить в понятие «боеприпас» патроны к огнестрельному оружию, добавив соответствующие слова в текст закона. Специалисты же РФЦСЭ МЮ РФ напротив, предлагают выделить из понятия «боеприпас» понятие «патрон»<sup>6</sup>.

Существенно разнятся также подходы специалистов упомянутых ведомств в отношении массо-габаритных копий или макетов огнестрельного оружия, изготовленных путем деактивации заводского огнестрельного оружия (переделкой основных частей, исключающих их использование по назначению).

Так, специалисты Экспертно-криминалистического центра МВД РФ считают, что подобные изделия остаются огнестрельным оружием независимо от их пригодности к стрельбе<sup>7</sup>. Обосновывая свою позицию, представители ЭКЦ указывают, что промышленно огнестрельное оружие изначально проектируется и изготавливается для гарантированного поражения цели. Любые конструктивные изменения его частей и деталей влияют

6 О.К. Зателин. К вопросу об отнесении различных видов патронов к боеприпасам // Военно-уголовное право. – 2005. - №4.

7 Кокин А.В., Мартыников Н.В. Проблемы нормативного регулирования оборота макетов массо-габаритных стрелкового огнестрельного оружия и их экспертного исследования // Судебная экспертиза. - Волгоград: ВА МВД России, 2012, № 2 (30). - С. 28-35.

только на исправность и пригодность к выстрелу, но не способны изменить целевое назначение изделия в целом.

Ряд специалистов Российского федерального центра судебной экспертизы Министерства юстиции РФ, образцы огнестрельного оружия, приведенные в непригодное к выстрелу состояние, признают макетами и не относят их к огнестрельному оружию. Аргументация в данном случае такова – внесение изменений в конструкцию заводского огнестрельного оружия, исключающих возможность производства выстрела, меняет целевое назначение изделия в целом и переводит его в разряд макетов.

В данном контексте следует отметить, что проблема отнесения к огнестрельному оружию изделий, изготовленных путем приведения заводского огнестрельного оружия в непригодное к выстрелу состояние носит, в основном, конъюнктурный характер и ее решение будет зависеть от позиции законодателя. С одной стороны, существует определенная категория законопослушных граждан, интересующихся оружейной тематикой (коллекционеры, историки, музейные работники и пр.), законные интересы которой необходимо учитывать. С другой стороны, отсутствие детальной регламентации оборота изделий, конструктивно сходных с огнестрельным оружием создает предпосылки для формирования «черного» рынка запасных частей к оружию, находящемуся в незаконном обороте либо для появления нового сегмента такого рынка. Известны случаи, когда под видом макетов открыто продавались образцы оружия с обратимыми изменениями конструкции, которые можно было привести в пригодное к выстрелу состояние, обладая небольшими познаниями в слесарном деле. На наш взгляд, в процессе решения отмеченной проблемы следует исходить, прежде всего, из интересов общественной безопасности, с учетом складывающейся криминогенной обстановки. Вместе с тем следует отметить, что проблема сущности понятия «огнестрельное оружие» остается открытой и требует дополнительного обсуждения. В частности, важно выработать единообразный подход к оценке целевого назначения заводских изделий, которые по разным причинам изменили первоначальное состояние.

Перспективным направлением в области стандартизации методик экспертных исследований, следует отнести разработку методов, основанных на количественной оценке признаков. Например, современное оборудование позволяет определять количественное содержание тех или иных элементов в продуктах выстрела. Это может быть использовано, например, для определения дистанции выстрела путем сравнения количества тех или иных веществ на исследуемом объекте с экспериментальными мишенями или эталонными сведениями. Трудность создания таких методик заключается в необходимости создания обширной справочной базы статистически надежных сведений о продуктах выстрела из различных моделей оружия различными патронами (т.е. эталона), которую можно получить лишь экспериментально. Между тем, преимущество подобных методик очевидна – достоверность их выводов может быть легко оценена по статистической вероятности экспертной ошибки. В перспективе может быть установлен порог приемлемой величины ошибки, исходя из которого суд может принимать решение о допустимости экспертизы как источника доказательств по делу. Очевидно, что по делам особой важности возможность объективной оценки достоверности выводов эксперта является существенным фактором. Между тем, в большинстве современных исследований на предмет дистанции выстрела статистическая вероятность экспертной ошибки не оценивается.

## ЗАКЛЮЧЕНИЕ

Подводя итог, обозначим некоторые, на наш взгляд, приоритетные направления по стандартизации методов решения судебно-баллистических задач:

Разработка детального классификатора судебно-баллистических задач.

Разработка унифицированных методов и методик решения судебно-баллистических задач, в том числе в виде национальных стандартов.

Переход от типовых методик решения задач к детализированным, адаптированным к конкретным экспертным ситуациям. Разработка и внедрение методик, основанных на количественной оценке признаков и позволяющих оценивать статистическую надежность выводов.

Разработка системы аттестации методов и методик решения судебно-баллистических задач.

Выработка единых подходов к пониманию базовых категорий, имеющих юридическое значение, в частности, «огнестрельное оружие» и «боеприпас». Внесение корректив в соответствующие нормативно-правовые акты.

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## NETWORK CRIME AND COUNTERMEASURES ANALYSIS FOR ONLINE SHOPPING

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**Abstract:** Today, the Internet is rapidly growing, we browse Internet every day, for communication, work, education, entertainment, and more and more people prefer to shop online than ever before. Because online stores are open 24 hours a day, seven days a week and their online catalogs of products always include more detailed than other traditional brick-and-mortar stores. Thus, sometimes people prefer visiting a store's Web site and ordering online directly rather than travelling to the store itself. Internet also makes people easy to compare products between different online stores, to receive feedbacks of product from other buyers, to seek credible details, and so on. Although the online shopping provides convenience for people, network crime brings high risks to e-commerce.

This paper explores the risks of online shopping behavior and features of network crime for e-commerce, and then analyzes measures in order to protect the benefits of online buyers. The rest of this paper is structured as follows: In section 1 we investigate the current risks of online shopping. In section 2 we discuss the situation of network crime for e-commerce. In section 3 we offer suitable countermeasures to online shopping buyers. In section 4, we provide investigative methods of network crime for police officers. In section 5, summary and conclusion are presented.

**Keywords:** online shopping, network crime, e-commerce.

### RISKS OF ONLINE SHOPPING

Now, the Internet is rapidly growing, we use Internet everyday, for work, play, communication, education, and more and more people are shopping online than ever before. However, there are some negative issues associated with online shopping. Network crime has been a severe test of online shopping, and has led to the early demise of many of e-commerce platforms. The lack of online privacy is the main problem to all of online consumers. When online shopping for some goods, such as shoes, DVDs, and commodities, the exposure of personal information may be a serious issue. Thus, more and more online consumers realize that the safety issue of online shopping is a crucial problem, and because credit cards using become very popular, people should pay more attention to such safety problem. The credit cards data was embezzled, online stores disappeared from the Internet after fraud actions, the supposititious Web sites of stores collected the information from credit cards owners, and all these are network crime issues of current online shopping. A recent research reported that "Cardholder Not Present" makes about 27% of all chargeback or refusal of payment; frauds with use of lost and stolen create cards makes 42%; and counterfeit cards makes 23%. It is necessary to note that creation and sending of a message "chargeback" cost \$12-17 for the bank.

Whatever, the simplex network crime mode is on the decrease, especially for sophisticated and intelligent criminal suspects. More and more people attend to safety of online shopping. The purpose of this paper is to help police officers clearly understand something about the network crime threats of online shopping, and make online consumers to know how to keep personal information safe when buying goods online.

### SITUATION OF NETWORK CRIME FOR E-COMMERCE

"How protect my personal information? Which online stores should I trust? Why they can capture my credit card details? ", such questions are very popular questions which be asked by online consumers. In the next few paragraphs we will provide an overview about frequent network crime approaches of online shopping.

#### Personal information theft

Personal information theft does not only occur in the offline world when a thief steals someone's credit card or ID book, but also exist in online shopping. The criminal suspect can use that personal information to access online bank account of victim, or open new accounts with the stolen information in different banks.



Most personal information theft occurs through online shopping, because of the following reasons:

- Reply the e-mails of buying advice that ask for personal information or bank details.
- Online shopping site pretends to be a legitimate company that tempts online consumers to provide their personal information.
- Personal account information is captured through MSN, Google Talk, Yahoo Message, Skype, and so on.

#### False online auctions

Online auction sites provide a virtual flea market for online consumers. But the online auction business can be risky company. Thousands of consumer report the crime of online auction fraud every year. Most cases focused on the following problems:

- Fail to receive the goods.
- Receive something, but the value lesser than expected product.
- Personal information (such as e-mail, post address, telephone number, etc.) is sold to third parties without agreement.

Some online consumers encounter other deceptive behaviors, including:

- Bid siphoning. An unethical criminal suspect tries to contact bidders through other seller's auctions for selling a similar item, and intends to trick buyers into sending money without delivering the item. This action is unjust to the original seller and extremely risky for buyers.
- Shill bidding. Shill bidding is an action that inflation of bid prices, by "shill". The "shill" can be the criminal suspect himself/ herself who has more than one user name or the criminal suspect's friend bids on the auction.
- Bid shielding. A criminal suspect camouflages as a bidder who use high bid to discourage other bidders from competing for the same product, then cancel his bid at the last minute.

Another type of false online auctions occurs when use third-party payment platforms. A criminal suspect camouflages as an online consumer. After an item placed the highest bid, the criminal suspect insists that the online seller use third-party payment service, but after online seller send the item to the third-party payment service which doesn't pay money to the online seller.

#### Phishing or spoofing

Phishing or spoofing is an attempt by false online customer service staffs to use fake e-mails, spyware, websites and instant messaging tricking online consumers into entering their personal information (e.g., credit card number, username and password, ID number, and so on) online. PayPal and eBay are the most targeted online shopping websites, and online banks also become targets frequently<sup>1</sup>. Figure1 shows the top 10 countries, facing increasing phishing attacks, accounts for 64.05% of all phishing attack victims within the 2012-2013 period, the report by Russian Kaspersky Security Company.



Figure 1 Top 10 countries with the highest growth rate in phishing attacks

<sup>1</sup> AlbertoR. Gonzales, Regina B. Schofield and David W. Hagy. (2007). Investigations involving the internet and computer networks. Washington, D.C.:U.S. Dept. of Justice, Office of Justice Programs.

Most approaches of phishing or spoofing use e-mail with official-looking links, and other relevant information taken from other trusted websites directly. Although these links may appear to be linked to a secure website, nevertheless personal information actually is sent to another website built by criminal suspect. Figure2 shows a phishing e-mail, including an illegal web address linking to a criminal suspect's website.



Figure 2 A phishing e-mail

Not all phishing scams require an illegal website. There is a new type of phishing crime that mixes the traditional approaches with social engineering techniques, which is called phone phishing. Phone phishing use e-mail to prompt online consumers to dial a customer support number with their bank accounts, personal identification number, password, or other valuable personal data, and the e-mail also warning that their account will be closed or other problems could occur if they don't contact them. Once the consumers dialed the phone number (owned by the criminal suspect, and provided by a Voice Over Internet Protocol), on the other end of the phone line, a person or an audio response device will prompts the callers to enter their bank account numbers, or provide their personal information.

## HOW TO KEEP ONLINE SHOPPING SAFE

The online shopping platform allows any consumer to purchase almost any product at any online website in the world and pay for his/her purchases without leaving the room. Thus, online shopping is really a good idea. However, if online consumers are not penetrating and sensitive, their online shopping experiences will be not **enjoyable and safe**. Here are a few steps to minimize online shopping risks, and to tell online consumers how to protect their personal information.

### Choose well-known websites

Normally, the well-known online shopping websites can provide perfect security mechanism for their customers. A well-known online shopping website transfers sensitive information from the online consumer's computer to online store's computer by using encryption tools. Encryption is the technology of hiding data between a sender and one or more recipient, and then the receiver (person or computer) can decode (decryption) data with correct key. Encryption confuses the sending data, such as password or important personal information, in order to protect integrity of data and prevent criminal suspects capturing important information in transmission. The only people who can unscramble the code are those with legitimate access permissions<sup>2</sup>.

How to know if an online shopping website is in a secure environment? Online consumers needn't to distinguish a website is secure or not by themselves, the web browser will tell us. By default, most popular web browser (such as Internet Explorer, Chrome, Mozilla Firefox, and Sa-

<sup>2</sup> Khosrow-Pour, M. (2004). IT Solutions Series: E-Commerce Security: Advice from Experts (pp. 1-194). Hershey, PA: IGI Global. doi:10.4018/978-1-59140-241-1.

fari) will inform user when enter a security website. However, if Internet users have closed these notification options, the different web browsers will show dissimilar visual symbols to users:

- Internet Explorer: Provides a yellow padlock in the bottom right corner of the browser window.
- Chrome: Show an icon at the top left of the window, if websites are secure, the icon is a lock; if websites are insecure, and the icon is a blank tab. User can click the icon to check the detailed security information of websites.
- Mozilla Firefox: Provides a padlock in the address bar and also in the bottom right corner of the browser window.
- Safari: Provides a padlock in the upper right corner of the browser window.

Another method to determine if a website is secure is to check the website address. Most secure websites will provide SSL (Security Socket Layer), the address of website will starts with “https”. The “s” that is displayed after “http” means that the website is secure.

#### Protect personal username and password

Most of e-commerce websites require the online shopper to register before searching and ordering an item. Thus, the shopper must enter the correct username and password. Online consumer must very carefully when selecting a password. Here are some advices to tell them how to select and protect their username and password.

#### Bad username and password:

Use real name, birthday, anniversary, address, phone number, ID number, student number, social security number, or any commonly known information as username or password.

- Use a password shorter than eight characters.
- Use a password of all digital numbers.
- Use very simple password.
- Use the same password for all of the online shopping websites.
- Use famous musicians, characters in literature, the names of actors, and other well-known places, popular people or things as username or password.
- Use personal information of spouse or child as username or password.

#### Good username and password:

- Use a mixture of upper- and lower -case letters, punctuation marks, digital numbers, and symbols.
- Use password longer than eight characters.
- Use special characters.
- Use uncommon phrase, and take the first, second or last letter of each word as password.
- Use a logger words, but deliberately misspelling one or more letters.
- The best password is one that is totally random generated, based on user’s imagination.

#### Protect username and password:

- Change all of your passwords frequently (i.e. at least once a semester).
- Do not write username and password down.
- Do not share username and password with anyone.
- Do not mention username and password in e-mail or any instant message applications.

#### Prevent personal information theft

As online shopping becomes more popular, there will be more cases of personal information theft committed over the Internet. Once the criminal suspect captured online consumer’s personal information, they will use victim’s identity to purchase products or open new bank accounts. Combining common-sense with the resources available through the Internet and other electronic systems can lower the occurrence of personal information theft. For preventing the personal information theft before it occurs, except for shopping at reliable and secure websites, online consumers also need to follow these principles:

For e-mail:

- Don't leave important e-mail in mailbox overnight.
- Do not reply any inexplicable pop-up message or e-mail that asks for financial details or personal information.
- Open any attachment, hyperlink, or download any files from e-mails carefully.

For personal information:

- After purchasing online, verify bank account records carefully.
- Immediately report after credit cards be lost or stolen.
- Do not lend ID book to any other people.
- Do not provide personal information to any people who contacts you through e-mail, chatting software or phone.
- Ask credit reports at least once a year and check for accounts that have been opened without your permission.
- If feel a bank card of password has been compromised, change the password as soon as possible.

Avoiding phishing and spoof

Phishing crimes continue to rise throughout the Internet on all types of websites. Today, e-commerce and online banking services are extremely safe, however as an overall general rule, online consumer must remain very careful when providing any sensitive personal information over Internet.

The following approaches can help online consumer avoid phishing and spoof attack:

- Don't click unknown links within suspicious e-mails.
- Don't fill out any forms in e-mails or online messages that ask for personal financial information.
- Check online shopping accounts punctually, and verify bank statements every month to make sure that all payments are correctly.
- Install the latest security patches of operating system and browser.
- Use different usernames and passwords for each online shopping account.
- Install and run security plug-ins of browser.

Pay by credit card

Online consumers could have many bank cards on hand, credit cards, debit cards, cash cards, or checks cards, but which kind of card is safest, in other words, which card is most suitable for online shopping? The answer is credit card. Because of if credit card has been misappropriated, online consumer have the right to dispute charges on credit card, and can withhold payments. Thus, the best way for online consumer is to apply one credit card that only for online shopping to make it easier to find out unauthorized payments. Before online consumer use their credit card for shopping online, please ensure the card is a real credit card and not a check card, an ATM card, and a debit card. Because the checking account could be wiped out in minutes, ATM cards are not protected, and a debit card will exposes bank account to criminal suspects.

Protect online consumer's PC

When you are shopping online, criminal suspects can catch password and important personal information through spyware or Trojan horse. Thus, how to protect online consumer's home PC, becomes a very important issue. The following lists some easy solutions in the following to keep PC safe:

- Run "Windows Update" every month.
- Install anti-virus, anti-spyware, personal firewall and spam filter software on computer, and keep them up to date.
- Use a secure browser, such as Chrome, Mozilla Firefox and Opera.
- Collect software from trustworthy websites, avoid the programs contain adware or virus.
- Install a pop-up blocker to stop unnecessary pop-up windows.
- Set up password for wireless Internet connection.

- Before selling or scrapping personal computer, hard disk, flash disk, or mobile hard disk, completely remove all data from hard disk by using a strong data wipe program.

As pointed out above, e-commerce security plays an important role in the ongoing development of information technology, as well as online shopping services. Making the online shopping safer and protecting online consumer has become integral to the development of new services as well as governmental policy. E-commerce security strategies – such as, the development of technical protection systems or the education of users to prevent them from becoming victims of cybercrime – can help to reduce the risk of online shopping.

## **INVESTIGATIVE METHODS OF NETWORK CRIME FOR E-COMMERCE**

When receiving a network attack report, the incident response plan should be professional, and a Network Crime Investigation Department (NCID) should be organized before the attack. The investigation department is response to help determine the objective of the investigation and identify each of the steps in the network crime investigative process (see Figure 3).

### Identifying suspects

Because of the features of virtual world, the network crime investigation work must start immediately. Current computer technologies make it relatively easy to hide a real location or identity, to use an unreal location or identity, or to make use of someone else's location or identity, this problem is more prevalent in Internet cafes and enterprise environments where multiple users or employees may have access to a computer or server and where passwords are shared or well-known, thus, such situation is very difficult to locate the crime suspect than in private houses. Such act of camouflage be achieved simply. For example, the re-mailing services can be used to disguise crime suspect's location or identity when sending e-mail, so the real location or identity can remain anonymous. By using multiple re-mailing services, crime suspects can make their transmissions almost impossible to trace<sup>3</sup>.

Some online shopping platforms accept digital application forms of online buyers, such short-sighted policy led to a lot of fabricated documents and false identities. When investigators try to locate crime suspect with network technological means, it is extremely difficult to determine precisely who is behind particular cybercrimes. Thus, investigators can try to use traditional investigative techniques, such as the use of video surveillance or collecting indirect criminal evidence. Because of the human rights issues and legal privileges, the use of intrusive surveillance is not always useful.

Today, few online user authentication systems adopt biometric identification technology, such as fingerprint or iris scanners when logging on. When such technologies become more widespread, investigators take advantage of biometric means of identification. Sweat, saliva, hair samples can also be gathered from mouse, monitor, keyboards, scanners and printers, by using DNA technology to identify the real users of computers in some cases.

### Identification of evidence

Before delving into the identification of evidence work, it is essential that the investigator have a thorough understanding of the types of evidence. The submission of evidence in any type of legal proceeding generally amounts to a significant challenge, but when network and computers are involved, the problems are intensified. Special knowledge is needed to locate and collect electronic evidence and special care is required to preserve and transport the electronic evidence. Electronic evidence in a network crime case may differ from traditional forms of evidence inasmuch as most computer-related evidence is intangible-in the form of an electronic pulse or magnetic charge.

<sup>3</sup> Liu Yang. (2012). Based on social network crime organization relation mining and central figure determining. In Proc of IEEE 3rd International Conference on Software engineering and service science (ICSESS), 22-24 June 2012, Beijing, pp.55-58.



The collection of evidence in any type of criminal investigation generally amounts to a significant challenge, especially for network crime. When facing the case of network crime, investigator has to collect all network-related evidence, such as the computer, network equipment, communications tools, and so on. Normally, there are four types of network-related evidence:

- Output evidence on monitor.
- Network transmission evidence on computer.
- Printed evidence on printer.
- Digital recorder (i.e., digital camera and voice recorder).

Real-time protection and detection systems must be used to minimize the amount of system damage when encounter a malicious attack. The automated filtering techniques can provide detailed defense logs and make network data more useful. IDS (Intrusion Detect System) can help in the identification of potential crime suspects. Once a malicious attack is detected, such technologies can automatically shut down the attacked device, and recovery a complete image of a virtual server from the primary data center or the disaster recovery data center. Thus, investigators can collect the logs of such protection and detection systems as useful evidences. In order to gather evidences, investigators also can use some investigation tools, such as Expert Witness, EnCase, DriveSpy and Byte Back.

Once evidence is collected, the investigator need to provide for its accountability and protection. The chain of evidence, which provides a means of accountability, must be adhered to by law enforcement when conducting any type of criminal investigation, including a network crime investigation. It helps to minimize the instances of tampering. The chain of evidence must account for all persons who handled or who had access to the evidence. A challenge that faces network crime investigators concerns data that have been encrypted by suspects who refuse to provide the decryption key or password. The simplest way to decrypt electronic evidence is to install a key logging program onto the computer of suspect that will capture the password used for decryption<sup>4</sup>. The installation of such a program, of course, must be done without the knowledge of the suspect and a special warrant needs to be obtained for such investigation behavior.

#### Investigation report

The goal of the investigation is to identify all available facts related to the case. The investigative report should provide a detailed account of the incident, highlighting any discrepancies in victim statements. The report should be a well-organized document that contains a description of the network crime incident, all victim statements, references to all evidentiary articles, pictures of the evidence and crime scene, drawings and schematics of the computer and the computer network, and finally, a written description of the forensic analysis. The report should state final conclusions, based solely on the facts. It should not include the investigator's opinions<sup>5</sup>. The investigator should keep in mind that all documentation related to the case is subject to discovery by the defense, so that investigator should exercise caution in any writings associated with the investigation.

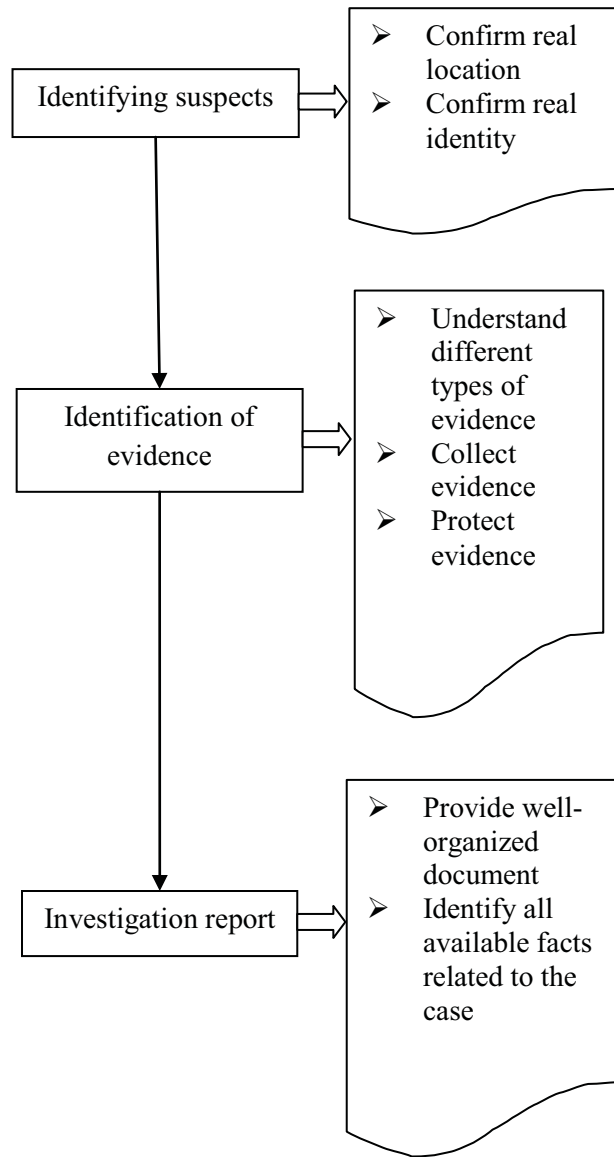
## CONCLUSIONS

This paper try to analysis the risks of current online shopping environments, provide useful self-protection approaches for online consumers, and then discuss the investigative processes of network crime. Normally, network crime investigation work focus on finding the crime suspects and collecting evidences. In the simplest case, this may include locating the physical address of crime suspect's computer, and confirming the crime suspect with conclusive evidences. However, when encountering tricky crime suspect, this investigative method may not be straightforward. Investigators gave to trace real computers which may locate in several different countries based on distributed computer technology.

4 Ernesto U. Savona. (2012). Organized crime enablers. World economic forum.

5 Giovanni Mastrobuoni & Eleonora Patacchini. (2010). Understanding organized crime networks: evidence based on federal bureau of narcotics secret files on American mafia. University of California-Irvine.





*Figure 3 Network crime investigative steps*

Anyway, if people ask that is online shopping safe? The answer is positive yes. Online shopping can be simple, convenient and cost-efficient. Most online companies competing in price that providing the online consumers a special kind of way to really save their money.

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## THE RESEARCH OF NUMERICAL SIMULATION ON NON-STANDARD FIREARM'S LETHALITY

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**Abstract:** This paper uses the numerical simulation program ANSYS to simulate the antipersonnel process of the sphere projectiles which are shot by firearm and uses the water by ANSYS to acquire the velocity attenuation curve, displacement curve, reduction of the total energy and the instantaneous cavity. Through comparing with the experiment results, the design of numerical model is improved and errors are reduced. After analyzed results of numerical simulation, it could be concluded that the lethality of non-standard firearm is huge and the instantaneous cavity is the significant factor to cause the tissue trauma and it should be the important reference factor in the examination of firearm's lethality.

**Keywords:** numerical, simulation, ANSYS, non-standard, firearm, lethality

### INTRODUCTION

Non-standard firearms are manufactured by non-regular manufacturers or by the suspects through self-control, conversion and imitation and other ways of production which raw materials, production processes, structure and properties are non-standard, and used for criminal activities. Such firearms are mostly used gunpowder or compressed gas for energy, and shot spherical metal projectiles. This kind of firearm projectile speed transmission is usually a few hundred meters per second, not only takes away the consciousness and the ability to resist of the victim but also his life. In the antipersonnel process of the sphere projectiles which are shot by firearm, how to achieve the lethal effect, how to prevent the damage caused by this effect, has been a concern issue in the field of wound ballistics.

High-speed projectile and target interaction is transient, large deformation and strong non-linear coupling phenomena, then the killing effect manifested as "bludgeoning effect", "penetration effect", "pressure wave effect", "cavity effect" forms, is a composite effect of a complex multi-physics phenomena. In the wound ballistics studies, the simple geometry of spherical projectiles, strong penetration capability, is widely used as the objects, while more than 80% of human tissue is water<sup>[1]</sup>, so water is often used as a substitute for human soft tissue. Over the years, the experimental model of human penetrating trajectory is often composed by these two components.

With the extensive application of finite element simulation technology research, the LS-DYNA simulation program as the representative of the finite element analysis software was more and more used in nonlinear dynamic high-speed collisions, explosions and other impact problems. This paper carries a numerical simulation for the lethality of non-standard firearms. The software will be used to analyze related laws of the spherical projectiles fired non-standard firearms in the water intrusion processes, for the analysis of firearms lethality, and develop scientific lethality standards, standardize the management of non-lethal weapons police use, to explore a suitable numerical simulation model and calculation method of spherical projectiles, provide a reference for the establishment of a non-standard firearms lethality evaluation system.

### NON-STANDARD BULLETS LETHAL EFFECT

High speed warhead launched into life targets can produce four different forms of function, so that the target would loss life or fighting capacity. Lethal effect principles are: liquid dynamic function, stop function and instantaneous cavity effect<sup>[2]</sup>.

Liquid dynamic function

1 <sup>[1]</sup> L koene, A Papy. Experimental and Numerical Study of the Impact of Spherical projectiles on Ballistic Gelatine at Velocities up to 160m/s[c]. 25th International Symposium on Ballistics Beijing, China, May, 2010

2 <sup>[2]</sup> An Bo, Jiang Jianwei, Jiang Haozheng. The Numerical Simulation of the Temporary-Cavity forming during the High-Velocity Steel-ball Penetrating into Water Medium [J]. Explosion and Shock Waves, 1998, 18(3) : 245~ 250.

When the high-speed bullet enters the more concentrated parts of the fluid, the sharp increase in the density of the medium, the resistance of the warhead forward suddenly increased, the warhead would pass the energy to the liquid, due to the incompressibility of the liquid, the impact pressure energy spreads around with an enormous pressure, thereby destroys the organization of the site. Generally believed that the rate of the warhead generates hydrodynamic effects should be not less than 600-700m/s.

#### Stop function

Stop function refers to the ability that the bullet hit the enemy and make the enemy lose the fighting ability, the size of the stop function, depending on the time the enemy lose the fighting ability after hitting, the shorter the time, the greater the power. Stop function is connected with the lateral warheads function, generally considered the larger diameter, the greater stopping power, so non-standard firearms wherever possible to use larger calibre. For the evaluation criteria of lethal effect, it is generally based on measuring the warheads loss energy after hitting.

#### Instantaneous cavity effect

The instantaneous cavity, a physical phenomenon, refers to a high-speed projectile penetrating biological tissue, brings a quickly change, is an important cause of severe trauma tissues and organs, the instantaneous cavity theory is the basis of the mechanism of wound ballistics injury. High-speed projectile penetrating into the aqueous medium process can be divided into four stages, the impact of the water, open cavity, the cavity is closed and the cavity pulsation disappeared.

Firstly, the projectile hit the water in a very short time, the formation of a high amplitude shock wave, in the form of spherical pressure wave propagation to the surrounding; its duration is very short.

Secondly, once the hitting water phase is completed, due to the radial expansion of water particles generated a conical cavity. The picture shows, the velocity of the cavity, is about 1/10 of the ball moving. The maximum displacement of the water cavity is directly proportional to the kinetic energy of the ball into the water. An inertia expansion of the cavity decreases the internal pressure, when the internal pressure is below atmospheric pressure, the formation of the outside air flow into the cavity, the cavity is open to the atmosphere, and then the cavity becomes an open stage.

Thirdly, with the increase distance of projectile penetrating into the water, the volume of the cavity is increasing and the cavity pressure difference between inside and outside is continuously decreasing and the radial velocity of the cavity wall decreases. At the opening of the cavity, water particles on the air - water boundary surface appear reverse speed and converge to the axis, closed cavity began. When the cavity is isolated from the atmosphere by the water layer, it forms a closed cavity.

Fourthly, since the cavity is closed, air inflation to the cavity stopped, the cavity pressure is not directly affected by the atmosphere, and after the cavity is closed by the action of hydrostatic pressure, which tends to a spherical shape; as the reduced volume of the cavity the pressure decreases and shrinkage occurs; Since the cavity is closed, the gas pressure within the cavity will be reduced because of the increasing volume of the cavity when the cavity pressure is greater than ambient pressure, the occurrence of cavities expansion, and so forth to form a cavity pulsation; after 7-8 times, it disappeared.

## PRE-TREATMENT OF THE PROJECTILE PENETRATING INTO THE WATER

High speed spherical projectile into the water is a highly nonlinear coupling phenomena, in the research process, the domestic and foreign scholars use coupling algorithm fully considered inertial effects and other coupled effects in the impact process, and also to simulate the whole the impact process more accurately<sup>[3]</sup>.

#### Finite element model

Spherical projectile calculation model is formed as follow. Spherical projectile diameter is 9mm,

<sup>3</sup> [3] Li Xiaojie, Jiang Li, Yan Hongbao, Zhao Zheng. Numerical Simulation on Low Inbreaking Handgun Projectile Drilling through the Water [J]. Explosion and Shock Waves, 2007, 27(4) : 319~324.

8-node solid 164 unit simulation, grid using Lagrange algorithm. Equally divided projectile radial into 8, 512 individual units. Since the projectile is relatively stiff, deformation in the course of penetration is small, no quality loss, in this paper, the projectile is made of pure lead, a rigid material model, and the density is 11.34g/cm<sup>3</sup>, elastic modulus 14GPa, Poisson's ratio of 0.42<sup>[4]</sup>. Suitable for high-speed flow coupling, and considering the high speed of the strain, strain rate and temperature effects, select the JOHNSON COOK material model for the lead shot. And Grüneisen equation of state was used.

Air and water calculation model is shown in Figure1. In the initial time projectile located in the air, the outer boundary of air and water using a non-reflective boundary conditions, the contact surface of air and water is co-node, grid structure using ALE multi-material algorithm, the warhead and water using flow structure coupling algorithm. Water and air material model are MAT\_NULL empty models provided by LS-DYNA. And Grüneisen equation of state was used, too.

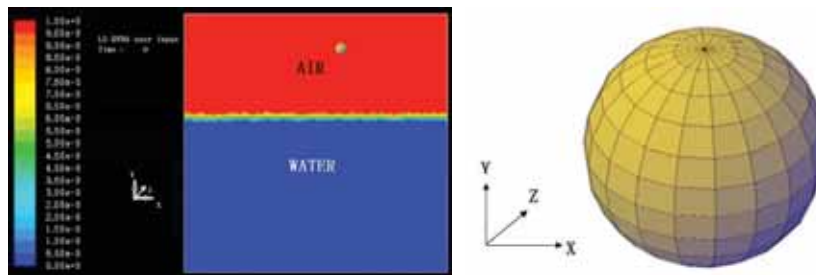


Fig.1:Finite model of the projectile entering water

Algorithms Introduction

Lagrange algorithm is shown in Figure2. Lagrange method is used for the solid structure stress-strain analysis, based on the material coordinates, the grid cell described as the “sculpture” in the structure, the described grid and analysis structure is integrated, which means that the finite element node is the material point<sup>[5]</sup>. When using this method, the analysis structural changes is consistent with the finite element grid changes, the material does not flow between the units. After diving in the water because deformation of lead projectile is extremely slight, this method can accurately describe the structure boundary movement, while avoiding the deficiency dealing with large deformation by this method.

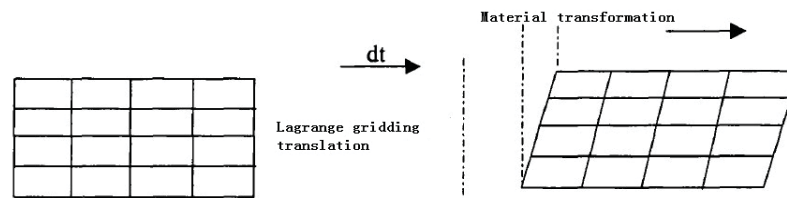


Fig.2:Grids's distortion in Lagrange algorithm

Fluid - structure coupling algorithm is shown in Figure3. The coupling interface between structure and fluid means that the program automatically assigns the surface of the structure is “subordinate” substances; the fluid part is the “main” substances. Lagrangian - Eulerian coupling method in the model can be used in the penalty function coupling coefficient, the main and subordinate interface don't need a special pre-treatment in the contact definition. When use the flow structure coupling algorithm to establish the geometry model and divide finite element grid, the model of structure and fluid , and the grid can overlap, in the calculation get the structural and fluid coupling by certain constraint methods to achieve the transfer of mechanical parameters.

4 <sup>[4]</sup> Luo Shaomin,Huang Gongwu,Chen Aijun. Numerical Simulation Analysis of Spherical Projectile Penetrating Gelatin[J]. Computer Simulation, 2012, 29(11) : 79~ 82.

5 <sup>[5]</sup> Zhang xiong,Lu Mingwan,Wang Jianjun.Research progress in arbitrary Lagrangian-Eulerian method[J].Chinese Journal of Computational Mechanics,1997,14(1):91-102.



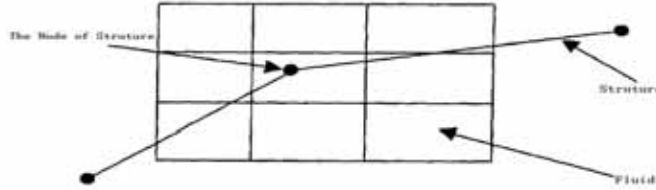


Fig.3: Coupling solution

JOHNSON-COOK material model is formed as follows.

$$\sigma_e = (A + B(\epsilon_e^p)^N)(1 + C \ln \dot{\epsilon}^*) (1 - (T^*)^M) \quad (1)$$

Among parameters,  $\epsilon_e^p$  is the equivalent plastic strain,

$\dot{\epsilon}^*$  is the relative equivalent plastic strain rate  
 $T^*$  is the relative temperature

A-yield stress; B-strain hardening; N-strain hardening exponent; C-strain rate dependency;

M- Temperature coefficient.

Fracture conditions (strain at fracture)

$$\epsilon^f = [D_1 + D_2 \exp D_3 \sigma^*][1 + D_4 \dot{\epsilon}^*][1 + D_5 T^*] \quad (2)$$

Among parameters,  $\sigma^* = \frac{P}{\sigma_{eff}}$  (The equivalent stress ratio of pressure and von Mises)

When the damage parameter is,  $D = \sum \frac{\epsilon}{\epsilon^f} = 1$  the fracture occurred.

$\epsilon$  is the equivalent plastic strain increment during the integral cycle period.

Grüneisen equation of state

$$P = \frac{\rho_0 C^2 \mu [1 + (1 - \frac{\gamma_0}{2}) \mu - \frac{\alpha}{2} \mu^2]}{[1 - (S_1 - 1) \mu - S_2 \frac{\mu^2}{\mu + 1} - S_3 \frac{\mu^3}{(\mu + 1)^2}]^2} + (\gamma_0 + \alpha \mu) E \quad (3)$$

C, a,  $S_1$ ,  $S_2$ , and  $S_3$  are constant concerned with the impact compression properties, C is the Us-Up (shock velocity - particle velocity) curve intercept;  $S_1$ ,  $S_2$ , and  $S_3$  are Us-Up slope coefficient, a is an volume correction to the Grüneisen coefficient;  $\gamma_0$  is Grüneisen coefficient; E is the material internal energy; Volume change rate  $\mu = P / P_0 - 1$ <sup>[6]</sup>.

Required concrete material models  $\rho = 11.34 \text{g/cm}^3$ ,  $A = 14 \text{Mpa}$ ,  $B = 17.6 \text{Mpa}$ ,  $C = 0.0035$ ,  $n = 0.685$  and equation of state parameter show in table 1.

Material	$\rho$ (g/cm <sup>3</sup> )	C(m/s)	$S_1$	$S_2$	$\gamma_0$	a
Lead	11.34	2030	1.47	0	2.78	0
Air	0.00125	344	0	0	1.4	0
Water	0.998	1650	1.92	-0.096	0.35	0

Table 1 The parameters of equation of state

6 [6] Cooper S R, Benson D J, Nesterenko V F. A numerical exploration of the role of void geometry on void collapse and hot spot formulation in ductile materials[J]. International Journal of Plasticity, 2000, 16: 525-540.

### THE RESULTS AND VERIFICATION OF THE PROJECTILE AFTER PENETRATING INTO THE WATER

The simulation results and verification of the velocity attenuation law when the projectile penetrating into the water

The simulation result of the velocity attenuation law is shown in Fig4. Observing the curve, we find that the speed of 9mm spherical lead projectiles is still 201m/s after 0.81ms. The Deceleration coefficient approximately maintain a constant.

The following equation can get the projectile velocity attenuation law after hitting the water. The speed when model hitting the water is  $V_0$ , Projectile maximum cross-sectional area, the projected area along the projectile resistance is  $A$ ; The quality is  $M$ ; assuming the resistance factor  $C_D$  is a constant at the beginning in the water, excluding gravity and buoyancy, the simplified projectile equation is:

$$\frac{1}{2} \rho V^2 AC_D = -m \frac{dv}{dt} \quad (4)$$

Deceleration coefficient, The integral equation is  $\alpha_0 = \rho AC_D / (2m)$

$$\frac{1}{V} = \frac{1}{V_0} + \alpha_0 t \quad (5)$$

In the formula,  $t$  is the time after the projectile into the water,  $V$  is the velocity corresponding to  $t$  in the water.

When the 9mm spherical projectile into the water, the Reduction coefficient is  $\alpha_0 = 1.944 \text{m}^{-1}$ . For a 9mm spherical projectile which initial velocity is 300m/s, the velocity attenuation approximate formula is

$$\frac{1}{V} = \frac{1}{300} + 1.944t \quad (6)$$

Fig 4 shows in the numerical simulation process, the initial velocity of the warhead is 300m / s. The difference of the numerical simulation results and technical results is very small, and it verified the reliability of numerical simulation by the LS - DYNA.

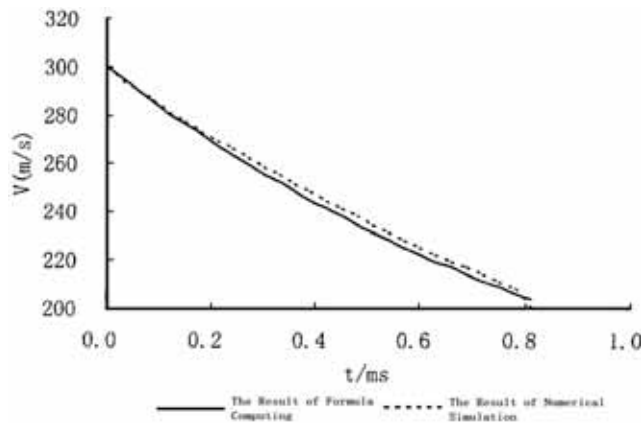


Fig.4: Simulant velocity attenuation and calculated velocity attenuation

The simulation results and verification of damage performance law

Draw the projectile displacement curve after into water by the velocity attenuation law, shown in Fig 5. After entering the water 0.81ms, the displacement of spherical lead balls is 20.37cm.

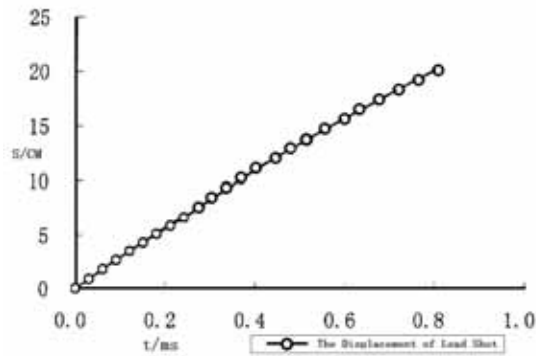


Fig.5: Displacement curve for 9mm spherical lead projectile

The numerical simulation of damage performance law is expressed as follows. The total energy of the projectile expression is

$$ET = E + I \quad (7)$$

The total energy can be divided into two parts; E is the kinetic energy of the projectile, I is the projectile internal energy. After the projectile enters the water, its total energy consumption will act on the water. The larger the total energy consumed, the greater the damage performance is. Calculated through LS-DYNA program, the projectile penetrating into the water, after 0.81 ms, the total energy consumption is  $\Delta E = 163\text{J}$ .

The experiment verification of the damage performance law is implemented as follows. 9mm diameter lead projectiles at a speed 300m/s shot water tank, and observe cavity forms after the projectile enters the water at 5cm and 15cm by high-speed photography, shown in Fig.6. From the comparison of the simulation results and high-speed photography of the cavity changes, the conclusion is the instantaneous cavity cross-section formed in the projectile killing is round; and the whole cavity is conical shape with a large inlet; with penetration depth increasing, the cavity diameter gradually becomes smaller. The shape of the cavity obtained by numerical simulation during the lead projectile penetrating process is consistent with the shape of the cavity shot by the high-speed photography in the experiment.

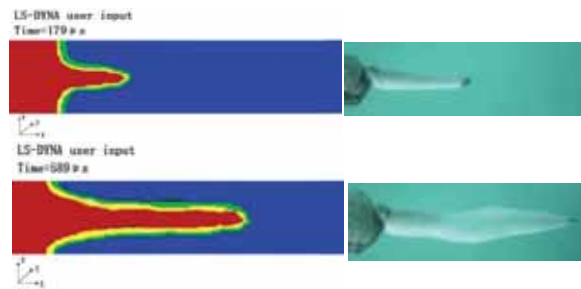


Fig.6: The cavity form comparison between the simulation and the high-speed photography

## THE RESULT ANALYSIS

After known the result of penetrating depth numerical simulation, it shows that the 9mm spherical lead projectile which has 300m/s speed could penetrate 20.37cm in 0.81ms. Due to the density of water is about 80 percent of the density of human tissue, as a result, the projectiles could penetrate near 16.30cm, which is approaching the body thickness of adult Asians.

From the result of velocity attenuation numerical simulation, we find that, after penetrated 20.37cm, the 9mm spherical lead projectiles which has 300m/s speed still has 87.49J kinetic

energy. In this case, the kinetic energy exceeded the standard of Firearm's Lethality, which is internationally recognized by 78J.

At first, the cavity of spherical lead projectiles is conical, shortly afterwards and it turns into ellipse. Before disappearing, the cavities are always connected to the entrance and pulsate several times<sup>[7]</sup>. It moves slowly along the direction of projectile until fracture. This phenomenon shows that, after the projectile gets through the human tissue, the diameter of wound ballistics will continue increase until form the maximum momentary cavities. Compared the shock wave pressure of numerical simulation, the wave trough between the first pressure peak and the second one appear with the maximum momentary at the same time. In other words, the maximum momentary cavities appear after the shock wave pressure sweep past and just at the time of the maximum negative pressure. According to the explain from R Berlin in 1976<sup>[8]</sup>, when high-speed projectile enter into medium, some medium flow adhesively at the front of projectile and flow out from the trajectory with the help of inertia. These medium separate from the projectile surface along a certain curve and form a cavity behind the projectile. Therefore, the wasted energy of projectile is mainly use for forming a cavity behind the projectile. More human tissue suffers shock-wave compression and be injured seriously, because the volume of cavity is much larger than the projectile. In consequence, the instantaneous cavity of spherical projectiles has the maximum lethality than other ballistic effects.

### CONCLUSION

This paper use the numerical simulation program ANSYS LS-DYNA, simulates the anti-personnel process of the sphere projectiles which are shot by non-standard firearm and uses the water by ANSYS to acquires the velocity attenuation curve, displacement curve, reduction of the total energy and the instantaneous cavity and summarize the following conclusions.

First, 9mm spherical lead projectiles which are shot by non-standard firearm in 300m/s speed could penetrate more than 20.37cm and have the ability that shot through an adult Asian.

Second, after penetrated 20.37cm in water, 9mm spherical lead projectiles still have 87.49J kinetic energy and have enough lethality to hurt people.

Third, the instantaneous cavity is the significant factor to cause the tissue trauma and it should be the important reference factor in the examination of non-standard firearm's lethality.

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**GSR AS TRACE EVIDENCE<sup>1</sup>**

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**Abstract:** Firing a bullet from a firearm is accompanied with the ejection of cartridge case and projectile as part of ammunition, gunpowder gases, fully and partially burned gunpowder particles, unburned gunpowder particles and chemical elements from the initial charge - lead, antimony and barium (the GSR). Since the GSR remain on the hands' skin, clothes and shoes of the person who took a shot, as well as in its immediate vicinity, with the detection of these particles we can identify the person who took a shot and also obtain other data relevant to solving a crime committed with the use of a firearm. In the forensic practice the traditional (chemical - diphenylamine test on nitrates) are being used as well as modern (physical-chemical) methods for the detection of GSR particles. Modern methods are based on quantitative and qualitative physical-chemical analysis of composition of elements in GSR and include atomic absorption spectroscopy (AAS), inductively-coupled plasma coupled with mass spectrometry (ICP-MS) and scanning electronic microscopy (SEM). In this paper we will discuss the ways in which GSR are created and methods for their detection and analysis, as well as evidentiary significance of GSR as forensic evidence.

**Keywords:** firearm, gunshot residues (GSR), methods for detection, analysis, identification, forensic evidence

**INTRODUCTION**

In order to successfully solve and prove the existence of a criminal offence and the perpetrator in cases that involve firearms it is extremely important to understand the process of firing bullets, as well as the traces that are occurring on that occasion whether they come from parts of weapons or ammunition. The bullet is a component of the weapon-ammunition system that includes projectile, casing, gunpowder charge and the primer that ignites the gunpowder charge. Gunpowder charge in this system acts as a source of energy that starts the projectile considering that the gunpowder is defined as propellants that combust during the self-sustaining and rapid exothermic reaction, the so-called stable deflagration and produces a large number of gas molecules at high temperature. All gunpowder are produced in such way that they burn fast and create rapid expansion of gaseous products in the confined space. Gunpowder combustion is happening in parallel layers with the velocity magnitude of  $10^2$  m/s and on that occasion the released gaseous products of reaction are expanding under pressure and launching a projectile. The energy created by burning the gunpowder pushes the projectile through the barrel. The projectile leaves the barrel (pipe) with the velocity magnitude of a few hundred m/s followed by decomposition products of gunpowder. The further gunshot residues travel from the pipe of firearm, the less concentrated and wider the pattern of gunshot residues becomes.

Thus, on the trajectory of a projectile one can find traces of the remains of unburned, half-burned or completely burned gunpowder particles from the gunpowder charge and decomposition products of the initial mixture the so called gunshot residues. These particles remain on the

<sup>1</sup> This article is the result of the research project Specifics within crime scene investigation of certain criminal offences realized at the Academy for Criminalistic and Police Studies, Belgrade, Serbia

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<sup>3</sup> Manager of the group for handling evidence material, forensic analytics and quality control in the Forensic Center, Police Directorate of Montenegro



hands skin, clothes and shoes of the person who shot, on the victims, but also on the people and things in their immediate vicinity, around the entry hole on the item through which the projectile passed, around the entrance wound on the victim, and they are considered as traces of the use of a firearm. In addition to these traces, other traces of the use of a firearm are the weapon that was used, its parts, ammunition and its components and micro traces on them and they can all be used to identify the weapon and the person who shot it. On the obstacles that were situated in the trajectory of the projectile there are also traces in the form of damage, holes or entry and exit wounds, etc. Some particles of combustion products remain within the barrel (pipe) and are being deposited on the inside of the pipe. After the forensic processing of the crime scene and forensic analysis in the laboratory, i.e. ballistic expertise, these traces can be used as material evidence for the determination of facts, time and shooting range.

To prove whether the suspect was actually shooting in the case in which the crime was committed with a firearm it is important to have knowledge of internal ballistics, because this fact is being established on the basis of traces of combustion of the gunpowder charge in the bullet of a firearm<sup>4</sup>.

### GSR (GUN SHOT RESIDUES) AS TRACES OF THE USE OF A FIREARM

After exiting the pipe of firearm, and due to the collision with air particles, velocity of powder particles decreases. Due to the fact that the GSR have very small mass their energy is decreasing as the distance from the weapon is increasing. GSR come out of the muzzle of the pipe, the gaps between the magazine and body of a firearm, i.e. gaps the cylinder and the barrel when firing is done with a revolver. "The residues are expelled from the barrel in a smoky cone shaped pattern"<sup>5</sup>. The size of a gap is different in different firearm constructions and it influences the amount of GSR that will remain of the hand of a person that took a shot.

Picture 1 shows the propagation of particles formed during the firing of short barrel firearm, particularly handgun. Clouds of gunpowder gases and other combustion products are seen in the area of the gaps on the firearm. Products that are coming out of the muzzle and moving forward after a projectile point out to the fact of shooting and can be used to determine the shooting range, while products that are moving toward the shooter can be used to identify the facts of shooting from the concrete firearm.



Picture 1. <sup>6</sup> Spreading of particles produced during the process of firing a gun: A - products that come out of the muzzle, B - products that are moving toward the shooter.

<sup>4</sup> Ivanović, A., Bjelovuk, I. (2010), Reliability of crime-technical methods for the detection of traces of gunshot residues on the hands of suspects, Security, Belgrade *Vol. 52*, no. 3, pages 7-23

<sup>5</sup> [http://www.firearmsid.com/a\\_distancegsr.htm](http://www.firearmsid.com/a_distancegsr.htm), available 26.11.2013.

<sup>6</sup> <http://www.impactguns.com/glock-19-9mm-fixed-sights-15rd-mags-pi1950203-764503502194.aspx> available Jan.10<sup>th</sup> 2014



Picture 2.<sup>7</sup> Spreading of particles produced during the process of firing a revolver: A - products that come out of the muzzle, B - products that are moving toward the shooter.

As the GSR move away from the muzzle, the gun powder halo becomes wider with a lower concentration of GSR. Besides the mentioned size of gaps there are many parameters that affect the concentration of GSR within the gunpowder halo or on the hands of the shooter. One of these parameters is the material from which the first obstacle through which the projectile passes is made off. From the material such as fabric it is much harder to sample the particles in comparison with some smooth and solid materials.

The GSR concentration within the halo or on the hands of the shooter is affected by the shape of gunpowder grains which were used to fill the bullet. Gunpowder grains are made in different shapes (sphere, flake, disc, etc.) so the unburned gunpowder particles will travel a different path depending on the shape and due to its aerodynamics. Thus, the unburned gunpowder spherical particles will travel a longer path since they have the highest aerodynamics when compared with particles of a different shape.

Since some elements of the combustion products remain on the projectile, at the first obstacle that the projectile encounters in addition to elements of the casing and traces of the bullet primer, there are also remains of the particles from combustion products and that creates the gunpowder halo around the entrance hole. Next to the entrance hole of the projectile a projectile void is created - a ring that is characteristic by the existence of particles of rust, dust, dirt and oil from the firearm barrel. In the case of the so-called contact, i.e. when the shooting range is zero because with the projectile the warm product from the combustion of gunpowder exit too and that can cause burns on items and on the flash. So in the traces of the use of a firearm - gunpowder halos one can find first of all the soot, lead (Pb), barium (Ba), or antimony (Sb). That does not exclude the presence of other chemical elements such as: aluminium (Al), sulphur (S), tin (Sn), calcium (Ca), potassium (K), chlorine (Cl), copper (Cu), strontium (Sr), zinc (Zn), titanium (Ti), silicon (Si). Some of those elements are being added during the process of production of gunpowder and some originate from the projectile casing and its protective layer. "Bullet cores are most often lead and antimony, with a very few having a ferrous alloy core. Bullet jackets are usually brass (90% copper with 10% zinc), but some are a ferrous alloy and some are aluminium. Some bullet coatings may also contain nickel."<sup>8</sup> Besides the mandatory nitrocellulose smokeless gunpowder contain some organic components, as well as compounds that contain nitrate or nitrogen. One of these compounds, diphenylamine (used as a stabilizer in the powder), can be detected using reagents containing sulphuric acid."<sup>9</sup> Smokeless powders usually contain cellulose hexanitrate or glycerol trinitrate depends on they are single or double based.

7 <http://www.impactguns.com/smith-and-wesson-500-500mag-4-inch-stainless-steel-adjustable-sights-rubber-grips-5rd-163504.aspx> available Jan.10<sup>th</sup> 2014

8 <http://library.med.utah.edu/WebPath/TUTORIAL/GUNS/GUNGSR.html>, available 25.11.2013

9 <http://library.med.utah.edu/WebPath/TUTORIAL/GUNS/GUNGSR.html>, available 25.11.2013

After firing a bullet from a firearm in its vicinity there is a dispersion of the organic and inorganic components. Organic components derived from gunpowder charge of the bullet and inorganic components derived from: the primer, cartridge and the projectile. With the use of mass spectrometry method the American forensic laboratory in FBI (Federal Bureau of Investigation) has separated twenty-three (23) organic compounds that occur after firing a bullet, and which originate from the gunpowder charge of the bullet. Those are the following components: cresol, resorcinol, carbazole, diphenylamine, dimethyl phthalate, n-nitrosodiphenylamine, dinitro-ortho-cresol, **carbanilide**, nitrodiphenylamine, triacen, nitrocellulose, Dinitrotoluene, RDX (cyclonite), diethyl phthalate, nitro-glycerine, trinitrotoluene, dimetilsebakat, metilcentralit, 2,4-dinitrodifenilamin, ethyl centralite, dibutyl phthalate, PETN (pentaerythritol tetranitrate) and butilcentralit. Expert investigation of firearms traces, using the detection of organic compounds, is very difficult and is still in development. Shortness of expertise for firearms traces with the use organic compounds is reflected in the fact that the methods for the determination of these organic compounds are unreliable, non-specific, approximate, i.e. will give a high percentage of false positive results.

As already mentioned inorganic components are the result of firing a bullet from a firearm and they originate from the primer, cartridge and projectile. The primer has four basic components: an initial explosive, oxidizing agents, fuel and sensitizer. Composition of initial explosive varies from manufacturer to manufacturer, but lead-styphnate (lead- trinitroresorcinat) is the one that is mostly used. Earlier the primer explosives that was used is lead azide and mercury fulminate ("bursting mercury"), but it was excluded from the use because of substantial corrosive effect that it had on the barrel (pipe) of a firearm. Oxidizing agents in the initial capsules are used to increase the heat of initiation, and for this purpose barium nitrate is commonly used, while the less commonly used is barium peroxide, lead nitrate or lead peroxide. Antimony sulphide and calcium silicate are commonly used as fuel in the initial primers and lead tiocinat, powdered aluminium, magnesium or zirconium and titanium powder are rarely used. Tetrazen is used as a sensitizer in the initial standard primers but the following are used s well: pentaerythritol tetranitrate, trinitrotoluene and tetryl.

Cartridge of a bullet for firearms is usually made of brass which in some cases can be mixed with nickel.

Firearm projectile is composed of a lead core, which is covered with a metal jacket made of copper which is mixed with 5-10% of zinc. However, some projectiles can be made only from lead, some of lead coated with a thin layer of copper, some of lead mixed with tin or of lead mixed with one and with other. Rifle ammunition has a projectile that has a core made of lead or iron covered with the jacket mostly made from a mixture of copper (90%) and zinc (10%).

As can be seen from the above, the inorganic components that contain traces of a firearm after firing a bullet from the same, are proving the presence of metals such as: lead (Pb), antimony (Sb), barium (Ba), copper (Cu), mercury (Hg), zinc (Zn), iron (Fe), rarely silicon (Si), aluminium (Al), nickel (Ni) and potassium (K).

To better understanding the importance of gunshot residues as trace evidence it is necessary to start from the process of production of gunpowder.

Propellants are usually divided into following groups: homogeneous propellants (created during gelatinization of nitrocellulose molecules through reaction between organic solvents and gelatinizers) and composite powders (created by mixing of crystal mineral compounds and organic binders). Since within homogeneous gunpowder except single base there are also two-base and three-base<sup>10</sup> which can be placed as gunpowder charge in casings for small firearms, that is the reason for which it is necessary to determine the type of gunpowder with the examination with mass spectrometry or other quantitative analysis. "The amount and pattern of residue deposited may vary by the gun used to fire the bullet"<sup>11</sup>. Single based gun propellants consist of nitrocellulose or mixtures of highnitrated and lownitrated cellulose, double based propellants consist of nitrocellulose and a liquid of an organic nitrate (nitroglycerin, dinitrodiglycol, etc.), And triple based propellants include nitrocellulose, nitro-glycerine and nitroguanidine or dinitrodiglycol. Apart from the above mentioned basic components there are stabilizers (di-

<sup>10</sup> Jaramaz, S. , Micković, D. (2002) Internal ballistics, Belgrade: University of Belgrade, Faculty of Mechanical Engineering

<sup>11</sup> Lepik, D., Vassiljev, V. (2010) Comparison of gunshot injuries caused from Tokarev, Makarov and Glock 19 pistols at firing distances of 1, 3 and 5 cm. Journal of forensic and legal medicine, 17 (8), p.412-420

phenylamine and centralite I) in the composition of powder are that prolong the life of powder. During the production of powders the plasticizers are added (dibutyl phthalate, diethyl phthalate and triacetin) whose role is to improve the mechanical properties of the powder. During the process of propellants manufacturing the energetically non active substances are added. These substances are called phlegmatizers and its role is to achieve chemical progressivity. Also, there are substances for reducing glare such as potassium salts.

No matter to which group the gunpowder charge that was used in the preparation of ammunition during belongs, its combustion makes products - nitrite based compound. GSR, besides in the form of the nitrate-based compounds can also be lead-based and that originate from the primer. Primers are used to start the ignition process in cartridges and commonly contain lead styphnate, barium nitrate, and antimony sulfide compounds. Also, some residues based on lead can be produced with melting of the lead from the bullet. Lead particles have much larger mass when compared to the other particles in the remains of gunpowder, and thus have a greater kinetic energy and they exceed much longer path.

Maximum range of GSR depends on the characteristics of the ammunition and weapon used for firing<sup>12</sup>.

In order to determine the shooting range it is necessary to make some firing tests with ammunition from the same weapon in the same obstacle as it was in a disputed situation and to examine the GSR. Lots of experiments of this kind were made in the ballistic laboratory<sup>13</sup>.

Traces of GSR can also be found on the victim's body. Most traces can be found around the entrance wound, but their presence is not excluded within the wound channel. At the exit wound the presence of traces of GSR is minimal or they cannot be found at all. At close range, macroscopic examination of the entrance wound is in concordance with microscopic appearance of GSR in all cases, but for distant range gross detection of GSR is negative in a third of cases, though microscopically present<sup>14</sup>.

The main modern methods for determining the presence of GSR can be grouped into analytical methods (atomic absorption spectrophotometry - AAS and inductively-coupled plasma mass spectrometry ICP-MS) and qualitative methods (scanning electron microscopy with energy dispersive analysis - SEM-EDA and atomic force microscopy - AFM).

While performing the forensic investigation of the crime scene where GSR are the traces they have to be treated as essentially similar with other trace - finding, labelling and if needed marking, fixing and making the report on investigation, photographic documentation, sketches and situation plan, report on the forensic examination of the crime scene. For further forensic processing gunpowder particles are excluded from the scene while respecting the established chain of evidence of movement<sup>15</sup>. Secondary GSR investigation involves the analysis in ballistic forensic laboratory. For the successful forensic GSR analysis it is necessary to respect all the standard procedures for crime scene investigation. Thus, "the examination of distance range based on GSR, the item on which the testing is made should be protected so there will be no transfers or falling of GSR"<sup>16</sup> To identify the facts and time of the shooting firearm must be seized from the crime scene with the obligation to protect the muzzle. For the determination of the GSR presence on the hands sampling is done with the using of a swab or the so called "paraffin glove" with the use of paraffin, silicone paste, adhesive foil, and it is necessary to emphasize that the samples should be properly packed. In the application of modern methods for the detection of GSR presence on the skin of a suspect special swabs are used for sampling at the crime scene. An important fact in the exclusion of GSR traces is that the amount of GSR is significantly reduced with the passage of time, touching other objects, putting hand in pockets and by washing and drying hands.

12 Busarčević, M. et.al. (2001) Basis of criminal expertise, Belgrade: Ministry of Interior, p. 284

13 More about the subject: Ivanović, A. (2002) Criminal-chemical investigation of traces of firearms, Podgorica, Ministry of Interior of the Republic of Montenegro; Maksimović, R., Bošković, M., Todorčić, U. (1998) Methods of physics, chemistry and physical chemistry in criminalistics, Belgrade: Academy for criminalistics and police studies; Копанев, А. С., Латшов, И. В., Никитин, И.И., Чулков, И.А. (2012) Стрелковое огнестрелное оружие и его следи на пулях, гильзах и преградах, Волгоград: Волгоградска академи МВД России

14 <http://library.med.utah.edu/WebPath/TUTORIAL/GUNS/GUNGSR.html>

15 More about the chain of evidence can be seen in: Milošević, M., Bjelovuk, I., Kesić, T. (2009) Quality management system in forensic laboratories, NBP – Journal for Criminalistics and Law, p.1-12

16 Franjić, B. (2009) Forensic ballistics, Banja Luka: International association of criminologists, page 43

### Methods of GSR trace analyses

Traditional methods of GSR trace analysis, in order to identify the shooting facts, are based on the procedure of proving the presence of nitrate in gunpowder by treating the traces with the solution of diphenylamine in sulphuric acid. The reaction is followed by the appearance of a compound with the characteristic blue colour. The process involves pre-sampling of GSR by pouring paraffin or silicone on the suspect's hands. Namely, in forensic practice today this method is rarely used because it is impractical (requires a radiator and container with paraffin, time to warm the paraffin, to apply it and to wait for it to harden with the existence of a risk that the person can get some burns) and it does not present an absolute proof at the court. The only advantage of this method is that based on the observation of paraffin glove the precise location of the existence of gunpowder can of gunshot residue be determined and the fact that this method can pick up a large percentage of GSR on the hands of the suspect in relation to the method of sampling with adhesive foil, which basically requires less time for the sampling. Silicone glove compared to a paraffin glove, is slightly more convenient method since it eliminates the risk of burns to the person and require less time. In this group, the most practical method of sampling is the use of adhesive foil for the gunpowder test considering the time needed for sampling. Drawback of these methods is the fact that the nitrate can be found in other compounds as well.<sup>17</sup>

Due to the very large disputes the method for GSR analysis after combustion, which is based on diphenylamine test which is also called the Gonzales test, methods that are being more used are those for the detection of elements of lead, antimony and barium. Metal particles are formed due to the rapid cooling of the combustion products, which were exposed to very high temperatures and under high pressure. For the detection of these characteristic elements the methods that have proven as reliable are some instrumental analyses methods such as neutron activation analysis and atomic absorption analysis.

Although very sensitive method in forensic practice neutron activation analysis is quite rarely used because it requires a large expenditure of funds and time in the duration of few days, which in the terms of legally limited time of detention is not acceptable. The disadvantage of this analysis is its insensitivity to the lead. It did not take root in forensic practice as a routine method for testing the traces of the use of firearms in terms of GSR testing.

In the forensic practice now days the analyses of GSR in may forensic laboratories in the surrounding countries are using the following analyses methods: Ditiiooksamid (DTO) test - method for the detection of traces of copper, Sodium rhodizonate (NaRho) test - method for the detection of traces of lead, Walker's test – method for the detection of traces of nitrite in gunpowder, SEM/EDX analysis of shooting traces - examination of shooting traces with the use of scanning electronic microscope with energy dispersive detector of X-rays (SEM/EDX), Gonzales test – method for determination of nitrate and nitrite from the gunpowder on silicone castings or in samples from the pipes,  $\mu$ - XRF analysis of shooting traces - method for the determination of traces of metal on the instrument for X-ray micro fluorescence EAGLE III.<sup>18</sup>

Atomic absorption spectrophotometry is a qualitative and quantitative analysis method based on fact that the atom of any chemical element has the ability to absorb radiation of such wave length that is characteristic for that element. This is a very sensitive analytical method ( $10^{-8}$ g) and it is mostly used for the examination of inorganic substances.

X-ray fluorescence analysis is based on the ability of atoms to absorb x-rays and in that case the electrons from the inner part of the electron cloud are being induced. Based on the emitted spectra of fluorescence X-rays the identification of chemical elements in an unknown sample, i.e. the qualitative and quantitative analysis, can be performed.

Scanning electron microscopy with energetic dispersive addition with X-rays SEM/EDX allows examination of elemental composition of particles (giving the elemental composition of the particles). A computer program is used to speed up the search for GSR particles by SEM/EDX method.

17 Maksimović, R., Bošković, M., Todorčić, U. (1998) Methods of physics, chemistry and physical chemistry in criminalistics, Belgrade: Police Academy; Franjić, B. (2009) Forensic ballistics, Banja Luka; Mašković, Lj. (2013) Criminal technique – CD, Belgrade: Academy for criminalistics and police studies

18 Mentioned tests are made in the centre for forensic examination, researches and expertises "Ivan Vučetić" in Croatia – source: <http://www.mup.hr/UserDocsImages/CKV/CFIIV%20-%20Ivan%20Vu%C4%8Deti%C4%87%20-%20Bro%C5%A1ura%2004-2013.pdf>



In the last few years of forensic practice for the GSR detection experts are using the inductively coupled plasma mass spectrometry (ICP-MS). This method allows the determination of zones affected by GSR and it provides information on whether the projectile that was used was with or without a jacket. By the way, mass spectrometry is used for the chemical identification of organic and inorganic substances on the basis of the mass spectrum which is a characteristic for a particular compound. It is considered a very sensitive testing method ( $10^{-14}$ g). Mass spectrometry with inductively coupled plasma (ICP-MS) is an analysis technique in which the inductively coupled plasma is used as the source of ionization, and the detection of metals or other elements is performed by mass spectrometry. This instrument uses a mass spectrometer, which with combination of physical restraint of a beam of ions that are passing through the narrow crack of different slits, and with specific constructions of MS (double focusing in electrostatic and magnetic fields) enables more precise focusing of isotopes. For this spectrometer is characterized by a very high sensitivity and the possibility of simultaneous testing of a large number of samples.

#### **Diphenylamine test on nitrates**

Paraffin gloves method, silicone gloves and gunpowder test with the use of adhesive foil can be considered to be unreliable because a large number of compounds that are widely used include nitrates that are transferred to the hands when handling them so that the application of the test could give a positive result even though the person was not firing a weapon (for example, chemists, pharmacists, printers, farmers, food industry workers, and other persons who have contact with chemicals). However, in the judicial practice it often happened that the view of ballistic experts were accepted, especially in cases where there are no other physical evidence, and they explained their argument telling that it was a GSR trace and not some other nitrate compounds with the specific form GSR when observed under a microscope. Here we should bear in mind that during the manipulation with these materials the shape of blue coloration differs from other traces of gunshot residues. "Based on the pattern of nitrate particles on the paraffin glove i.e. on the hand an expert can assess whether these traces are from a gunpowder or from some other substance. For example, if a hand is contaminated with nitrogen fertilizer contamination zone will encompass the whole hand, especially the palms, while the nitrate particles after shooting can be found in typical locations such as the index finger and the thumb root<sup>19</sup>."

#### **DTO test for identification of copper traces after the shooting of a firearm**

Copper particles formed after firing a bullet from a firearm are detected by the *dithiooxamide* (that also has the name rubeanic acid - that has a chemical formula  $C_2H_4N_2S_2$ ). Test with *dithiooxamide* (DTO) was first introduced in the forensics by Kubota scientific professional journal: AFTE Journal, no. 12:1 from January 1980.

*Dithiooxamide* (DTO) test is a very efficient and effective test for use in expert investigation of firearms traces in order to determine the shooting range and to determine whether the suspect was actually shooting during the critical event. DTO test is more applicable than similar tests used for determining firearms traces, for example reaction of DTO reagents with copper particles is 15 times more sensitive than the reaction of sodium rodizonat reagent with particles of lead, which also occur after firing a shot. From the experiments presented in this paper it can be seen that the best use of DTO test is in determining the shooting range. This test should be improved in order for further determination of the shooting angle, that is the angle under which the projectile hit the target. As for the test to determine whether a person was actually firing a weapon, DTO test is very usable in the detection of traces of copper on the sleeves of the person who did the firing and less effective and feasible in the detection of traces of copper in the so-called "paraffin gloves". This test should be complemented with the application of some of the instrumental chemical analysis, and the most appropriate and most practical would be the use of atomic absorption spectrophotometry (AAS). AAS analysis could be applied in such a manner that the traces of olive green colour are only examined for the presence of copper, and also for the amount of the copper.

<sup>19</sup> Simonović, B. (2004) Criminalistics, Kragujevac: Faculty of Law (in Serbian), page 429



### **Na-rodizonat test for the identification of lead traces after firing a shot**

Sampling of firearm traces, for the performance of Na-rodizonat test can be performed with a number of different techniques. This paper will show the use of adhesive transparent foil that were used during the performance of the tests in the laboratory of the Centre for Crime Technique of the Ministry of Interior of Montenegro. With this method of sampling of firearms traces on the hands of suspects it is possible to determine not only their presence but also their schedule. To perform the test it is necessary to have 15% of acetic acid or 5% of hydrochloric acid, sodium rodizonat, distilled or deionised water, and plastic spray pump with dispenser.

The advantages of this test compared to the so far used, the *diphenylamine* test method are: ease of use, the relative speed of the test performance, low cost of the test, the ability to perform it in the field. Test with sodium rodizonate reagent is very sensitive. Namely, this test can detect the lead particles of 1 µg. To confirm this test more completely, it can be done in combination with the SEM/EDX method. First the whole area would be sampled (for example with clothing or surfaces interior, cars, etc.), and treated with sodium rodizonate test, and only the places on which there could be lead particles would be treated with SEM/EDX device. By using only the SEM/EDX methods one cannot get good results, but with the combination of these two methods, colorimetric and instrumental would give complete confirmation if the detected lead particle, sampled from the surface, actually comes from firing a bullet from a firearm. In this way we would be completely sure that the critical particle comes from firing a shot. Also, sodium rodizonate chemical test may be applied when performing an expertise in determination of shooting range and determination of whether an impairment on some clothes was created by the entrance of a projectile from a firearm or not.

### **Atomic absorption analysis**

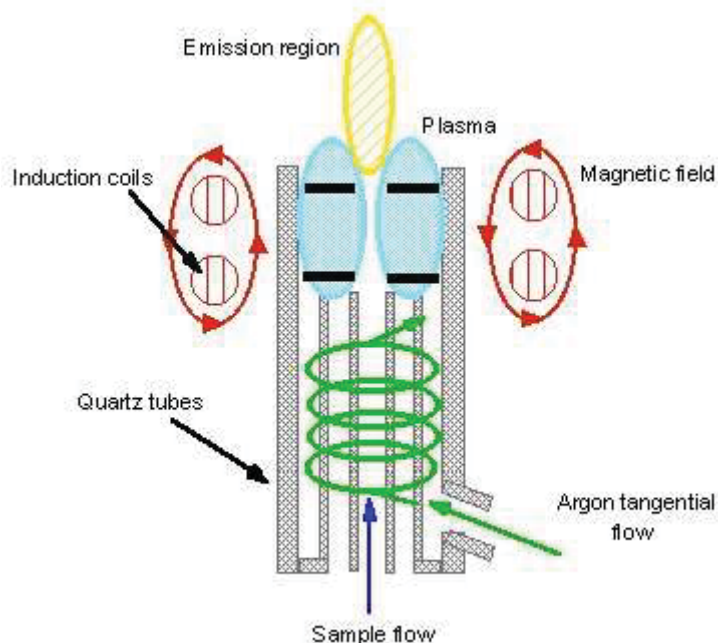
Flameless atomic absorption spectrometry - FAAS is also used for testing GSR traces. In order to perform the analysis it is necessary to collect traces for the suspect's hands. Sampling is usually done with the adhesive tape. In order to perform testing it is necessary to prepare the sample and bring it in non-induced atomic state when after the exposure to certain wavelengths of radiation they will be absorbed by the atoms. In order to prove whether a person did the actual shooting atomic absorption spectrometry method in its work uses the inorganic elements.

#### **X-ray fluorescence analysis**

X-ray fluorescence analysis can be applied in the analysis of metals for shooting traces, specifically micro X-ray fluorescence (µ-XRF analysis of shooting traces).

### **Inductively-coupled plasma mass spectrometry (ICP-MS)**

Method ICP-MS is very sensitive (< 0,1 mg/l), and method ICP-MS can be applied for analysis of GSR as micro traces. Picture 3 shows schematic presentation of the ICP-MS method on which it is clearly seen that the atomization of tested sample is made in plasma at the temperature of few thousands K.



Picture 3. Schematic presentation of ICP-MS<sup>20</sup>

#### Scanning electron microscopy (SEM/EDX)

In the forensic practice the most applicable method for testing the traces of the use of fire-arms is the scanning electron microscopy. The sample of GSR is treated within a scanning electron microscope with magnification up to 300000 times and the occasion it detects micro traces. When the beam hits the GSR particle which has the required elements (for example lead, antimony or barium) x-rays will appear with characteristic wavelengths. Using energy dispersive addition with X-rays qualitative and quantitative analysis of micro trace is performed as well as the determination of its chemical composition. This method proves also the morphology and the particle size. Sampling is done with the use of special aluminium discs from the suspect's hands. The disc has an adhesive surface that contains graphite, which makes the sample usable for examination under a microscope. If the sampling would be performed in a different way (for example adhesive foils) it would be necessary to make evaporation in vacuum with the use of gold or graphite and that makes the process expensive and complex. Under a microscope GSR particles have distinctive spherical shape, although there are some particles with different shapes.

### DISCUSSION

Assessing the importance of forensic evidence in general, and the analysis of gunshot residues is very complex and responsible task. Therefore, it is necessary to have knowledge on the basic capabilities and limitations of expertise methods and a certain dose of criticism to evaluate all presented evidence. A judge should not blindly accept expert opinion, but he/she must be well informed about the methods applied and their reliability. This is especially important in cases of confronted opinions of few expert witnesses who testify as experts.

When we compare the method of paraffin gloves and a method of adhesive foil for the collection and analysis of traces of gunshot residues on the hands we will notice a number of advantages and disadvantages in both methods. The advantage of the method of paraffin gloves is that the outpouring of the heated wax on the hands of a suspect heats the skin and widens

<sup>20</sup> <http://rign.hr/~sborosos/IAM/IAM1.pdf> available 2014-01-12

the pores which enables the collection of almost all of the particles. The disadvantage of this method is that it is very demanding when it comes to space, time and in terms of possession of equipment, and it is also very risky since it can hurt the person whose skin is being sampled. The sampling procedure is especially difficult when several persons were present at the crime scene. The method of adhesive foil on which there is a drawn hand contour has the advantage that it requires less time and resources on the crime scene, but it is evident that the smaller number of particles can be collected in comparison with paraffin glove. Also, the method is highly subjective. The only advantage of this method lies in its practicality in terms of the short time required for sampling, and low costs.

Locations of found gunshot residue are very important. The person who was holding a firearm and fired from it will have a higher concentration of GSR particles on the hands, especially at the characteristic zones (back of the hands - index finger, the root of the thumb) as opposed to the person who came in contact with a weapon after it was fired from it. A person who has just grabbed a weapon from which it was fired will have a higher concentration of GSR on the inside of the hand (the palm, thumb and fingers). The existence of GSR on a person who was present at the crime scene and did not shoot depends primarily on the distance from the place at which the persons stood in relation to the weapon. Compared with the shooter and the person who came in contact with a weapon from which a shot was fired, the existence of GSR traces on those other persons is the smallest. In regard of that, the paraffin and silicon gloves methods have an advantage over the use of adhesive foil.

As diphenylamine test on nitrates is a reaction to prove the nitrates that is the reason for which this method is not considered an absolute proof in judicial practice since nitrates can be found in other substances such as fertilizer, canned food, etc. It should be kept in mind that during the handling with these items that the shape of blue particles is different than the GSR shape. Therefore, when giving a final opinion one should be very careful. Also, the information obtained in this way may not be discarded, but can be treated in the context of all other indications by the court. Traces in diphenylamine test may indicate "active" and "passive" weapons holding. In most developed countries, this method has been abandoned and is not recognized as evidence in judicial practice<sup>21</sup>.

Although a very reliable analysis neutron activation analysis has not become a routine in forensic practice because of the high cost of realization, the passage of time needed to obtain the results and its insensitivity to lead.

Atomic absorption spectrophotometry is not that used as a routine method that is used in forensic practice because it gives a high percentage of false negative results (between 50% and 60%)<sup>22</sup>.

Although very accurate methods, neutron activation analysis and atomic absorption spectrophotometry were not shown to be absolutely reliable for determination of the person who fired from a weapon in its critical occasions. The reason for this conclusion lies in the fact that this method is used for the detection of inorganic elements that are resulting from the decomposition of a mixture from primers during firing process. A positive result that is obtained in this way cannot claim with absolute accuracy whether the person has fired or just had contact with another person who took a shoot (for example shaking hands) or had a contact with a weapon from which previously was fired. These methods cannot provide an answer to the question of when exactly the contamination of the hands with GSR particles was made. Nowadays both methods are hardly applicable for the analysis of GSR particles.

X-ray micro fluorescence as a method for the analysis of GSR traces is proved to be very fast, easily applicable and non-destructive method of very high sensitivity. It serves for the examination of the composition of the primer.

The advantage of the scanning electron microscopy method is the fact that under the microscope one can observe details on the surface of GSR that will be tested as well, and the ability to distinguish partially burned gunpowder particles. Also, the process of photography to document the claim is simple.

Unlike the methods of NAA and AAS, method SEM/EDX is reliable to a certain degree since it detects chemical composition of the GSR particles. For example if the chemical com-

21 Šimonović, B. (2004) *Criminalistics*, Kragujevac: Faculty of Law (in Serbian), p. 429

22 Čimburowić, Lj., Ivanović, A., B., Ivanović, A.R. (2011) *Criminalistic techniques*, Belgrade (in Serbian), p. 356

position of GSR particles from the hands of the suspect and the chemical composition of the particles of cartridge from the crime scene do not match it cannot be stated that a person took a shot in that critical situation. The match of the chemical composition of GSR particles on the hands of the suspect and a sample from the crime scene indicates a high probability that the suspect fired a gun from which the bullets were fired and which cartridges are being examined. As a very reliable method for testing GSR particles that gives a response if a person did fire from a weapon is the SEM/EDX method which is recommended for use by ENFSI associations to all of its member states. The advantage of this method is that it is non-destructive. Among the all mentioned advantages there is the disadvantage of SEM/EDX method - the higher limit of detection. Also, one can say that the sample containing GSR particles does not mean the fact that the suspect shot from a firearm.

“Technically, you can get a positive result with only ONE particle characteristic of GSR; however, an increased population of particles increases the probability that the particles can be associated to the discharge of a firearm”<sup>23</sup>.

One must not ignore the fact that in the forensic practice of the United States of America the number of forensic examinations of traces for the use of firearms in the form of GSR particles is decreasing. Namely, the absolute reliability of this method has been questioned because of the few convictions that were based on the findings and opinions of experts who applied SEM/EDX examination of GSR particles and then it was proved that the suspect did not shoot in that critical situations. That is why the forensic science continues to investigate possibilities of different methods for the analysis of GSR particles. The advantages of LA-ICP-MS are high sensitivity and bulk analysis with low detection limits<sup>24</sup>. Also, as the advantages of the method LA-ICP-MS one can give the existence of low noise due to high excitation and high-temperature plasma, high sensitivity of the method, possibility of simultaneous estimation of a large number of elements, as well as high speed of operation with low consumption of samples.

As a disadvantage of this method one can consider the fact that it can be used only as a qualitative method considering the non-homogeneity of the GSR particles. The other disadvantage of this method for analysis of GSR particles is the fact that it cannot confirm morphology or chemistry of a single particle. Instrument for testing with this method of analysis is very expensive and there is an evident and large consumption of Argon (Ar), which limits the possibilities to use this method of analysis.

## CONCLUSION

As it can be seen from the foregoing, no method for analysis of GSR particles cannot be distinguished as absolutely reliable method for the identification of the person who took a shot in the critical situation.

Taking into account the cross section that was given it can be concluded that each of the existing methods have several advantages and disadvantages. Although no methods for testing GSR particles cannot be separated as absolutely correct, we believe that the method that still needs to be emphasized is SEM-EDX as a non-destructive method, because the sample may be examined several times and in that way one can get repeatable results. Although apparently it looked like that LA-ICP-MS as a method will avoid many of the shortcomings of other methods for GSR testing, at the end this analysis cannot be considered as absolutely favoured.

When compared with other methods the method SEM-EDX was by the experts from the European Society of Forensic Institute (ENFSI) recommended and validated in accordance with ISO 17025. That fact makes this method stand out from the others.

While analysing judicial practice, among all the other evidence, there were cases where it was not possible to prove that the person shot during a critical situation, although the result of the analysis of GSR particle with SEM/EDX method was positive, so it is necessary to continue the search for a more reliable method. Till the finding of the most reliable method and possibil-

<sup>23</sup> <http://www.gatewayanalytical.com/webinar-replays/what-police-attorneys-need-to-know-about-gunshot-residue-analysis/> retrieved on Dec. 28th 2013.

<sup>24</sup> Štüllová, K., Vaculovič T., Kanický, V. (2013) Analysis of gunshot residues by LA-ICP-MS, available from [http://mnet.mendelu.cz/mendelnet2013/articles/48\\_stulova\\_889.pdf](http://mnet.mendelu.cz/mendelnet2013/articles/48_stulova_889.pdf) retrieved on Dec. 28th 2013.

ity to ensure its implementation, it remains to apply a combination of the existing methods and to apply first of all those that are repeatable and non-destructive and then destructive methods of analysis.

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21. Žarković, M., Bjelovuk, I., Kesić, T. (2012) Criminal investigation at the crime scene and credibility of scientific evidence, Belgrade: Academy for criminalistics and police studies (in Serbian)



## INNOVATION OF CRIMINALISTICS TACTICS IN LITHUANIA: SHIFTING APPROACH ON THE ORGANIZATION OF PRE-TRIAL INVESTIGATION

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**Abstract:** The article analyzes a shifting approach on the modern organization of pre-trial investigation as the essential direction of the development of Lithuanian criminalistics tactics and allows the formation of the modern philosophy of this process.

The achievements of modern criminalistics tactics are not dissociated from process of effective crime investigation and case analysis. Research results showed that the organisation of a pre-trial investigation in Lithuania is one of the most relevant directions of the development of modern criminalistics tactics. Developing as a field of scientific knowledge, the criminalistics tactics became complicated not only as the system of affirmations, means and recommendations conducting investigative acts but it also involves the organization, planning of pre-trial and judicial investigations, selection of preventive measures, implementation of organizational and technical measures, definition of qualification and competence of pre-trial investigation subjects'. Investigation of criminal offences is a complex, multistage process, which becomes impossible without a proper coordination of the activity of professional pre-trial investigation subjects. Therefore review of the concept of organising pre-trial investigation, the overhaul of cooperation of pre-trial investigation subjects' and their qualification and competence became one of the most important presumptions formed the optimal model of the organization of pre-trial investigation.

On the other hand the scientific discussions raise a new proposal to pay attention to personality traits of pre-trial investigation subjects' – currently there is a lack of research in Lithuania on the discussed issue.

The knowledge of criminalistics tactics in the context of organization of pre-trial investigation will be developed in the future, it will have a bigger importance not only in the system of criminalistics theory but also it will influence effectiveness of investigative activity. Criminalistics tactics should continue to be an open, functional and evolving system, joining together intellectual, procedural, emotional, voluntary, tactical elements, not having strict boundaries and seeking to optimize the process of crime investigation. Relations analyze of criminalistics and criminal process, educology, psychology, modern management is very influential for the realization of the aforementioned developmental directions of criminalistics tactics.

**Keywords:** competence, criminalistics tactics, qualification, organization of pre-trial investigation, police officer, prosecutor.

### INTRODUCTION

**Relevance of the study.** Important issues of pre-trial investigation's organization were already identified few decades ago. The establishment of the rational police practice model became a solid assumption to improve the process of pre-trial organization and, moreover, form the effective criminal investigation background<sup>1</sup>. Lithuanian researchers<sup>2</sup> pointed out that the organization of pre-trial investigation as one of the core fields of criminalistic's tactics<sup>3</sup> has recently been changing its format. The monolithic nature was prevalent in previous approaches of the organization of pre-trial investigation. This process was more related to the

1 Goldstein H. Improving Policing: A Problem-oriented Approach. Crime and Delinquency, 1979. P. 25.

2 See more: Navickienė Ž. Model of Organising Pre-trial Investigation in Tactics of Criminalistics. Doctoral dissertation: social sciences: law. Vilnius: Mykolas Romeris University, 2011. Also see: Ancelis P. Functional Compatibility in the Effective and Fair Prosecution. Vilnius: Mykolas Romeris University, 2012. Also see: Ancelis P. Pre-trial Investigation Stage in Criminal Procedure. Monograph. Vilnius, 2007.

3 Research results showed that organization of pre-trial investigation is one of the most important trends of the development of criminalistics tactics in Lithuania. See more: Navickienė Ž. Model of Organising Pre-trial Investigation in Tactics of Criminalistics. Doctoral dissertation: social sciences: law. Vilnius: Mykolas Romeris University, 2011. P. 42.



organizational means of criminal investigation such as material technical resources, prosecutor's or investigator's working load and management, etc<sup>4</sup>. Furthermore, it was noted<sup>5</sup> that the application of diverse models of the organization of pre-trial investigation in the other countries had significant impact on the development of its conception's different meanings. To be more precise, in one states pre-trial investigation is constructed and decisions of cases are made by a prosecutor, while in the others this representative only observes and controls the same process and consults investigators.

Consequently, the new conception of the pre-trial's investigation organization is formed. It's principles also influences Lithuanian Criminal Procedure Code that was newly adopted in 2003. In a narrow sense the organizational function of pre-trial investigation is attributed to the prosecutor's competence, while more broadly it is a core interest and quality indicator of all pre-trial investigation's institutions. Therefore, this process doesn't limit itself only in technical-organizational elements as previously, but also includes complex knowledge of the criminal procedure, management and educology. It covers more constituent components which directly influences the quality of pre-trial investigation, i. e. review of the previous approach and formation of the new conception, definition and appropriateness of the competence and qualification of subjects of pre-trial investigation, enhancement of possibilities for intra and inter-institutional cooperation. Accordingly, active discussions<sup>6</sup> on the means of the optimization of pre-trial investigation's organization has revived in Lithuania in 2005-2013. Distinct organizational components were comprehensively examined<sup>7</sup>, the model of organising pre-trial investigation<sup>8</sup> also the compatibility of subjects of pre-trial investigation was analyzed<sup>9</sup>. In addition, much attention had been paid for cooperation strengthening in order to consolidate and solve problems of pre-trial investigation under inter-institutional level. It is important to mention a new handbook on criminalistics tactics was published where the separate elements of criminalistics tactics were systematized<sup>10</sup>.

**Novelty of the study.** The shifting content of organization of pre-trial investigation forms a new conception of this process. Meaning that the most of issues associated with organization of pre-trial investigation are still present (for example, working load, definition of education, personality characteristics' profile of investigators), it allows to present not only the solutions for already identified problems, but also demonstrate the shifting approach of the content of this process and give recommendations for improvement of the means of organization of pre-trial investigation in the field. The content of pre-trial investigation's organization was analyzed several times by Lithuanian researchers. They paid much of attention to the individual components of the organization of pre-trial investigation. For example, the aspects of subjects of pre-trial investigation's cooperation and qualification improvement were analyzed by M. Šatas<sup>11</sup>

4 Kuklianskis S. The First Principles of Organization in Criminal Investigation. Vilnius, 1995.

5 Navickienė Ž. Optimization of the Pre-trial Investigation Organization in Lithuania: *nunc or ad feliciora tempora?* Criminalistics and Forensic Examination: Science, Studies, Practice. Chapter II. Vilnius, Charkovas, 2013. P. 304.

6 Jurka R., Jovaišas K., Kanapeckaitė J., Mišeikis Ž., Baliutavičius S. Scope and Caching Options for Optimization of Criminal Process – Vilnius, 2004. Also see: Ancelis P. Pre-trial Investigation Stage in Criminal Procedure. Monograph. Vilnius, 2007. Also see: Ancelis P. Development Trends of Criminal Procedure after the Entry into Force of the Code of Criminal Procedure of the Republic of Lithuania in 2003 // *Jurisprudencija*, 2008. Nr. 6 (108). Also see: Šatas M. The Particularities of the Co-operation Between Public Prosecutor and Preliminary Investigators // *Criminalistics and Forensic Examination: science, studies, practice – Vilnius*, 2007. Also see: Šatas M. Cooperation between Pre-trial Investigator and Prosecutor in the Investigation of Serious Crimes. Doctoral dissertation: social science: law. – Vilnius: Mykolas Romeris university, 2011. Also see: Šatas M. Some Peculiarities of Cooperation in Relationship of Prosecutor and Pretrial Investigator in Lithuania // *Criminalistics and Forensic Examination: science, studies, practice – Vilnius*, 2011. Also see: Navickienė Ž. Model of Organising Pre-trial Investigation in Tactics of Criminalistics. Doctoral dissertation: social sciences: law. Vilnius: Mykolas Romeris University, 2011. Also see: Ancelis P. 10 Years Since the Adoption of the Code of Criminal Procedure of the Republic of Lithuania: Theoretical and Practical Problems in the Pre-trial Stage. *Public Security and Public Order. Scientific articles 2013(10)*. Mykolas Romeris University, 2013. P. 4-15.

7 Šatas M. Cooperation between Pre-trial Investigator and Prosecutor in the Investigation of Serious Crimes. Doctoral dissertation: social science: law. – Vilnius: Mykolas Romeris University, 2011.

8 Navickienė Ž. Model of Organising Pre-trial Investigation in Tactics of Criminalistics. Doctoral dissertation: social sciences: law. Vilnius: Mykolas Romeris University, 2011. P.57.

9 Ancelis P. Functional Compatibility in the Effective and Fair Prosecution. Vilnius: Mykolas Romeris University, 2012.

10 *Criminalistics. Tactics and methods. Handbook*. Mykolas Romeris university, 2013.

11 Šatas M. Cooperation between Pre-trial Investigator and Prosecutor in the Investigation of Serious Crimes. Doctoral dissertation: social science: law. – Vilnius: Mykolas Romeris University, 2011.

and the author<sup>12</sup> of this article. Also, the problems of compatibility of pre-trial investigation were examined by P. Ancelis. However, it would be necessary to present the summarized shifting view to the organization of pre-trial investigation that forms distinctive philosophy and keeps considerably strong positions in criminalistics tactics.

**The goal of the research** is to present the content of the shifting approach on the organization of pre-trial investigation as the essential direction of the development of Lithuanian criminalistics tactics.

The main objectives of this research:

To present shifting concept of organising pre-trial investigation as the starting point on the formation of philosophy of organising pre-trial investigation.

To identify the essential direction of the development of organizing of pre-trial investigation in the context of Lithuanian criminalistics tactics.

**The subject of this research** – the content of the shifting approach on the organization of pre-trial investigation.

**The methodology of the research.** The research has been conducted by means of an analytical method. Relevant legal and scientific literature resources were analyzed. The study aims to examine various approaches to conceptions of pre-trial investigation organization, qualification and competence of pre-trial investigation subjects' as well as presumptions related to effective organizing pre-trial investigation.

In the first stage of the research a criterion for choosing resources according to the Keywords has been selected: criminalistics tactics, conception of organization, effective organization of pre-trial investigation model of pre-trial investigation organization, qualification, competence of pre-trial investigation subjects'. According to this selection criterion a search for diverse legal acts, documents, audit reports, scientific resources, and publications has been conducted in the data bases of the legal acts and scientific articles. In the process of the analysis of scientific resources the author has searched for sources related to conceptions of pre-trial investigation organization. 16 sources have been chosen: scientific papers, monographs that analyze the content of organization of pre-trial investigation.

In the second stage of the research of the analytical method – descriptive content analysis was used. The essence of this method is to set conceptual units significant in terms of research, i.e. existence of particular words and notions in the text. The words and notions distinguished in this research are organization of pre-trial investigation, content of pre-trial investigation organization.

The analysis of scientific literature grounds the relevance of research, reveals content of organization of pre-trial investigation in Lithuania. Descriptive content analysis of the documents helps to examine peculiarities of pre-trial investigation organization, to compare content of organization in Lithuania and different foreign countries.

## **A NEW CONCEPT OF ORGANISING PRE-TRIAL INVESTIGATION AS THE STARTING POINT ON FORMATION OF MODERN PHILOSOPHY OF THIS PROCESS**

Criminalistics was developing in a separate way varying from country to country and it was the reason for the emerging of four different schools – Germanic, Romanic, Anglo-Saxon and Russian schools<sup>13</sup>. The attitude to content of criminalistics tactics and its components was developing distinctively in each abovementioned school. Not once has been discussed what criminalistics tactics place is in terms of criminalistics system. Some researches, for example, V. A. Obraztsov stated, that the most suitable would be the binomial criminalistics system, which would include general and special parts, and criminalistics tactics content is to be seen as a special part of the criminalistics science. But even more interesting discussion, especially related to the criminalistics tactics content: is to distinguish crimes investigation organization

<sup>12</sup> Navickienė Ž. Model of Organising Pre-trial Investigation in Tactics of Criminalistics. Doctoral dissertation: social sciences: law. Vilnius: Mykolas Romeris University, 2011.

<sup>13</sup> Malevski H. The Main Schools of Criminalistics and the Formation of the Modern Model of Criminalistics in Lithuania. Criminalistics and Forensic Examination: Science, Study, Practice. Vilnius, 2009. P. 94.

and planning as an autonomous part of the system and not count as a component of criminalistics tactics. Individual researches' opinions on this matter stood out: R.S. Belkin believes that the organization of investigation of criminal acts can be discerned in two levels: separate organization of pre-trial investigation assigned as criminalistics tactics and crimes investigation organization in general – as criminalistics methods. The author believes, that the pre-trial organization and planning, however, is a complex, holistic process in terms of content, it is a part of criminalistics tactics. So, training of versions and planning of criminal acts investigation – is a part of criminalistics tactics. Organization and planning of criminal acts investigation are applied to criminalistics tactics due to typical characteristics of criminalistics tactics such as (universality, independence from separate types of criminal acts). In accordance with the characteristics referred to criminalistics tactics include cooperation in investigating criminal acts and the use of special knowledge questions. A. G. Filipov claims that these criteria are too broad and uncertain, and on the basis of the following criteria criminalistics can be included into criminalistics tactics, except criminalistics methods<sup>14</sup>. These discussions prove once again that criminalistics tactics is open, not having strict borders, having a close contact with other parts of criminalistics, as well as with other sciences and knowledge system. Although it remains a scientific discussion of the place of pre-trial investigation in criminalistics, it is unanimously agreed that, pre-trial investigation concept and content is shifting at present.

Comparing the development of criminalistics in Lithuania and other countries, e. g., US, United Kingdom, Russia, it is obvious to note that there are common essential questions which are relevant for different schools of criminalistics even these countries belong to different schools of criminalistics<sup>15</sup>. H. Malevski noted that the important subject of criminalistics knowledge is the law enforcement officers' activities and its organization<sup>16</sup>. Therefore pre-trial investigation organization is relevant and connective question in all schools of criminalistics and this question catches the eye of researchers. Therefore, this process determines a successful outcome of the case. Seeking to define the organization of pre-trial investigation in Lithuania as the process for the effective criminal investigation, it is worth analyzing former conceptions of this process<sup>17</sup>. In Lithuania the pre-trial investigation organization had the typical organizational point and was analyzed in connection with the planning of activity, assignment of tasks, focusing the efforts to achieve certain objectives. The concept of pre-trial investigation used to have a technical character. In accordance with S. Kuklianskis, when analyzing the content of pre-trial investigation organization, this process could be defined as scientifically based method. The essence of that method includes the consistent and purposeful focusing of efforts to achieve the objectives of criminal investigation<sup>18</sup>. Therefore pre-trial investigation organization was seen as the well-balanced selection, arrangement and use of the potential, the instruments and the measures which are disposed by the investigator, the creation and the use of the optimal conditions seeking to investigate the cases<sup>19</sup>.

14 Filipov A. G. Continuation of Discussion (Again about Forensic System). Vestnik kriminalistiki. Vypusk 1(13). Moskva, 2005. P. 25.

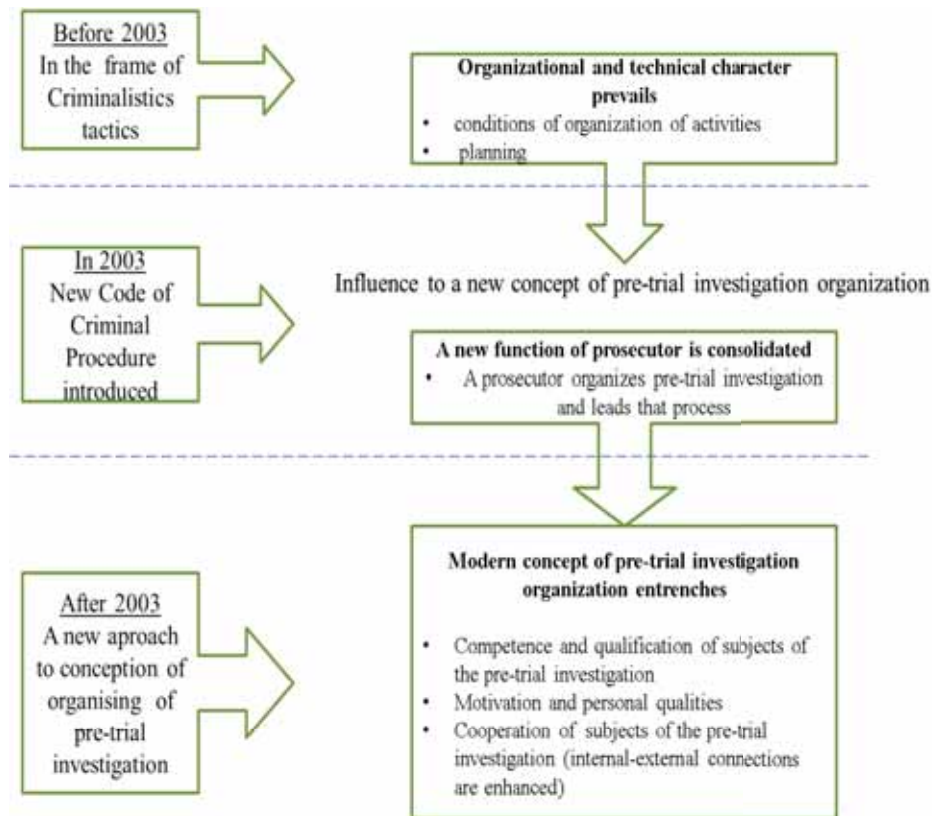
15 Navickiene Ž. Former and Modern Conception of the Pre-trial Investigation Organization. Internal Security. Semiannual Journal, Volume 5, Issue 1. 2013. P. 175-176.

16 Malevski H. Theory of Criminalistics (Forensic Science) – *quo vadis?* 10 year for Code of Criminal Procedure of Lithuania Republic. Collection of scientific articles. Vilnius, 2012. P. 236–237.

17 Navickiene Ž. Former and Modern Conception of the Pre-trial Investigation Organization. Internal Security. Semiannual Journal, Volume 5, Issue 1. 2013. P. 176-177.

18 Kuklianskis S. The First Principles of Organization in Criminal Investigation. Vilnius, 1995.

19 Investigations Acts in the Criminal Procedure. Collective of authors. Vilnius, 2011. P. 17.



1 picture. Alterations of content of organising pre-trial investigation

In the past, the concept of pre-trial investigation was not validated in the Criminal Procedure Code of the Republic of Lithuania. Therefore the previous conceptions of that process more emphasize the form of the organization and pay more attention to the organizational and technical character of that process. In 2003 the new power of attorney for the subjects of pre-trial investigation was validated and the function of the organization of pre-trial investigation was designated to a prosecutor (see 1 picture).

The conception of organization of pre-trial investigation is not static since the organizing process is the constant ongoing progress. The two components of the process were revealed: in the strict sense, this becomes the function of the prosecutor, in the broad sense—in all the leverage which ensures qualitative and effective execution of pre-trial investigation, not dissociating with a former technical character.

Diversity of approaches from researchers in the field related to the organization of pre-trial investigation process is raising discussion about modern content and components of this process. Currently it is appreciated that the organization of pre-trial investigation is getting important assumption for more efficient criminal investigation process. Therefore it is important to aspire to revise the content of the organization of pre-trial investigation and to implicate such elements as competence and qualification of pre-trial investigation subjects (see 2 table).

**THE ESSENTIAL DIRECTION OF THE DEVELOPMENT  
OF ORGANIZING OF PRE-TRIAL INVESTIGATION  
IN THE CONTEXT OF LITHUANIAN CRIMINALISTICS TACTICS**

Identifying current directions of pre-trial investigation in Lithuania, the most significant decidable procedural regulation aspects<sup>20</sup> should be emphasized – the purification of the procedural position of the subject of criminal procedure (especially of the investigator, his chief, the prosecutor and the pre-trial judge) and the most optimal link among their interaction. This could mean that not only the content of the power of attorney of these subjects must be reconsidered but also the format and possibilities of the effective cooperation must be foreseen.

Currently as one of the most important pre-trial investigation professional competence strengthening opportunities for police officers in Lithuania is implementation of conclusions and recommendations suggested by the The National Audit in the area of improving the organisation of pre-trial investigation<sup>21</sup>. Police Department under the Ministry of the Interior this year created the plan<sup>22</sup> on the basis of recommendations given by the State Audit. There are three basic areas of improving the organisation of pre-trial investigation measures in the plan: activity, training and strengthening the inter institutional cooperation.

<b>Content (elements) of organising pre-trial investigation</b>	<b>Previous content</b>	<b>Modern content</b>
Subjects' harmonizing activity based on criminal procedure	+	+
Common activity based on modern management	–	+
Definition of personal traits and motivation	–	+
Cooperation of subjects	+	+
Definition of subjects' qualification	–	+
Definition of subjects' competence	–	+
Conditions of work organization in investigation	+	+
Strengthening of interagency cooperation in the context of training (joint training)	–	+

*1 table. Content of the organising pre-trial investigation*

20 Ancelis P. Development Trends of Criminal Procedure After the Entry into Force of the Code of Criminal Procedure of the Republic of Lithuania in 2003 // *Jurisprudencija*, 2008. Nr. 6 (108). P. 39-40.

21 National audit report of the National Audit Office of Lithuania "Whether the preconditions for the effective organization of pre-trial investigation are framed" of 20 December 2012. [interactive]. [seen 2013-10-31]. <[http://www.vkontrolė.lt/audito\\_ataskaitos.aspx?tipas=2](http://www.vkontrolė.lt/audito_ataskaitos.aspx?tipas=2)>

22 Order of the Lithuanian Police Commissioner General "On the approval of the action plan on the implementation of recommendations rendered in the national audit report "Whether the preconditions for the effective organization of pre-trial investigation are framed" of 18 January 2013, No. 5-V-44.



***The improvement of the definition of subject's qualification in pre-trial investigation***

Conclusions of the National Audit state<sup>23</sup>, that the difficulty of the organisation of pre-trial investigation is inadequate qualification of some prosecutors and pre-trial investigators. Not all of them have a degree in law and not all of the prosecutors have enough of experience in pre-trial investigation. According to the data of December 2012-2013, there were 1109 pre-trial investigators working at regional police stations, more than 200 (about 20 percent) of whom did not have a degree in law (some of them are studying to get the degree) Nearly 900 of the workers have a legal education. It is widely debatable about equalising the categories of investigators' positions: to change categories from B to A. Unfortunately, most of policing institutions do not have financial possibilities for such changes, as this requires a lot of additional financial resources. We note that the rise of minimum wage would not help to attract lawyers to vacancies.

Seeking to equalise the same practice of special requirements for statutory and civil servants, the Police General Commissioner recommended for the heads of police institutions to set the following requirements for unoccupied and new duties, officers who will be carrying the functions directly to the Criminal Procedure Code and Administrative Code (heads of criminal and public subdivisions, investigators and specialists) as well as the preparation, evaluation and application of legislations:

- For A level positions to have a higher university education in law either public safety degree in social studies field
- For B level positions to have not lower than a higher non-university degree in law education either public safety degree in social studies field.

The document also specifies that the exceptions can be applied only for the positions occupied by the statutory or carrier civil servants who will respectively implementing the specific functions, for instance: criminal acts in cyberspace, in economics, in undercover investigations or criminalistics investigations etc.

Lithuania is the only country of the European Union where police officers have to pay for studies providing a higher degree according to the police officers training programmes (law degree and police activities and public safety studies) There is no necessary financial funding designated for police officers training. The current model of study funding, which applies the principal of study basket as well as the conditions of targeted study financing, do not allow to take into account the needs of police staff training, staff training specifics and requirements when police is one of the most important institutions that ensures public safety and order. It is necessary to impose an appropriate financing in order to motivate and professionally prepare police officers. The government must invest into a police officer in order to require professional and high quality implementation of his functions in the future.

The analysis of the questions during pre-trial investigations that prosecutors ask reveals the lack of professional experience. Although, the Criminal Procedure Code defines the prosecutor as the organiser of pre-trial investigation, the data of the research shows that there were 80 prosecutors employed in 2008-2010, 44 of whom did not have the working experience in pre-trial investigation, however they had a three years of working experience in the field of law, as it is required under the Prosecutor's Office law of the Republic of Lithuania<sup>24</sup>.

***The influence of personal qualities and motivation for the professional activities***

The analysis of the organisation of pre-trial investigation leads to more and more discussions on the efficiency and success of the process being determined by internal factors like personal qualities and motivation of the subjects of pre-trial investigation. A lot of attention is being drawn on the topic in scientific literature of foreign countries. The U.S. scientists emphasize such personal qualities as common sense, perspicacity, intuition, street knowledge, team work, etc<sup>25</sup>. Other U. S. scientists draw their attention on necessity of having a high degree of self – discipline and the possibility to learn from every person that the investigator encounters during

23 National audit report of the National Audit Office of Lithuania "Whether the preconditions for the effective organization of pre-trial investigation are framed" of 20 December 2012. [interactive]. [seen 2013-10-31]. <[http://www.vkontrole.lt/audito\\_ataskaitos.aspx?tipas=2](http://www.vkontrole.lt/audito_ataskaitos.aspx?tipas=2)>

24 The Prosecutor's Office law of the Republic of Lithuania of 13 October 1994, No. I-599. [interactive]. [seen 2014-01-08]. <[http://www3.lrs.lt/pls/inter3/dokpaieska.showdoc\\_l?p\\_id=463814&p\\_tr2=2](http://www3.lrs.lt/pls/inter3/dokpaieska.showdoc_l?p_id=463814&p_tr2=2)>

25 Lyman M.D. Criminal Investigation: the Art and the Science. 6th ed. – New Jersey: prentice hall, 2011. P. 21.



the process of criminal investigation<sup>26</sup>. R. M. Gardner notes that an investigator must not limit his attitude, so called, „tunnel vision“ but must divide the phenomena of investigation into several parts and put the whole as a puzzle<sup>27</sup>. Moreover, critical thinking skills and the possibility to use deductive and inductive logic in evidence interpretation are also important for the analysis, generalisation and explanation of investigated phenomena<sup>28</sup>.

In scientific literature and legal acts in activity descriptions and position descriptions of our country a lot of attention is drawn to the definition of professional qualification and competence of the subjects of pre-trial investigation. However, scientific and applied investigations lack the professional attitude towards the importance of personal qualities in the activity of the subjects of pre-trial investigation. There is only a fragmented intimation about what personal qualities are needed in the activity of investigator or a prosecutor. In Lithuania, while analyzing the competence of pre-trial investigator, a professional qualification has been stressed lately. A strong role of the investigator is accepted in criminal acts investigation, however the influence of necessary personal qualities for the professional activities is not identified. While analyzing the organization of pre-trial investigation, scientists<sup>29</sup> do not argue upon the importance to examine necessary personal qualities for the subjects of pre-trial investigators and emphasize their importance, because this effectively influences the process of pre-trial investigation.

Lithuanian scientists<sup>30</sup>, seeking considerably to examine the further influence of personal qualities for the competence, have recently deliberately chosen to analyze the content of the necessary competence for pre-trial investigator: the connection of the necessary personal qualities and professional qualification. The identification of the necessary personal qualities for an investigator would allow create a reliable investigator's profile and realize if someone, who chooses the work of the investigator, for instance, a future student has those necessary qualities and would be able to apply in his future carrier. According to the author's opinion, the research of investigator's personal qualities and professional competence would make assumptions to form a new portrayal of a reliable professional investigator.

Negative tendencies have been noticed in the field of police staff recently, while more and more of police officers are quitting their jobs and little newcomers are employed. Investigators of all level are missing in Criminal police, for example, there were 274 free vacancies for investigators in November 2012. It shows that it is necessary to solve the problem of motivating investigators to work in the police system, to apply more effective promoting measures and to solve the problem of creating the salary mechanism that would match the complicity and volume of the work. Moreover, the purpose in 2014 is to create the technique of equal workload calculation which would help equalizing the workload of investigators.

#### ***The formation of competences in the area of pre-trial investigation***

In 2012 the competence description of police officers and other police system employees was confirmed<sup>31</sup>. The document entrenched the competences of occupational, special and additional features for police officers as well as for police officers who deal with procedural activities. In the same year the competence acquisition and updating procedure order was also confirmed<sup>32</sup>. The aim of its document is set the process of competence acquisition and updating procedure order by police officers and to relate this process to the carrier of the police officer (horizontal and vertical), the improvement and evaluation of professionalism. One of the ways to achieve and update the competences is to participate in further improvement programs. The minimum duration of competence acquisition or update is set in the order – from 40-80 academic hours. On the purpose to review and update the program of pre-trial investigator's further improvement, the new module of further improvement program for the pre-trial investigation police officers

26 Swanson Ch. R., Chamelin N.C. Territo L. Criminal Investigation. Sixth edition. Mc graw-Hill, 1996.

27 Gardner R. M. Practical Crime Scene Processing and Investigation. CRC press LLC, 2005. P. 19.

28 Swanson Ch. R., Chamelin N.C. Territo L. Criminal Investigation. Sixth edition. Mc graw-Hill, 1996. P. 18.

29 Navickienė Ž. Optimization of the Pre-trial Investigation Organization in Lithuania: *nunc or ad feliciora tempora?* Criminalistics and forensic examination: science, studies, practice. Chapter II. Vilnius, Charkovas, 2013. P. 314.

30 Navickienė Ž., Izotovas A. Professionalism Dimensions of Criminal Investigator: Professional Competence and Personality Traits. Public Security and Public Order. Scientific articles 2013(10). Mykolas Romeris university, 2013. P. 146-163.

31 Order of the Lithuanian Police Commissioner General “On the approval of the description of competences of police officers and other police system employees” of 6 April 2012, No. 5-V-284.

32 Order of the Lithuanian Police Commissioner General “On the approval of the description of procedure on the obtaining and refreshing of competences of police officers” of 17 July 2012, No. 5-V-514.

in criminal and public police was prepared in Lithuanian Police School<sup>33</sup>. The module provide the organization of training with focused identification of the necessary areas of the activity, in which the pre-trial investigation officer should acquire knowledge and form new skills or renew his knowledge and skills again.

***The strengthening of interagency cooperation in the field of training***

The purpose of criminal procedure is to defend human rights and freedom of people and civilians, defend the interests of society and state, quickly and comprehensively reveal criminal acts and apply the law properly, so that the person who committed the crime would be fairly punished and the innocent would not be prosecuted.

The National Audit Office of the Republic of Lithuania stated in the report of the state audit<sup>34</sup> that the equal application of practice of pre-trial investigation implementation is not ensured and the qualification of pre-trial investigators stays insufficient. This shows the lack of training organization. The pre-trial investigation institutions do not combine the need of investigators' training with the Prosecutor's Office, the program for all subjects of pre-trial investigation is also insufficient. As a result, the possibility to organize and carry out the pre-trial investigation in a more effective way is uncertain. If more common training programs were prepared for prosecutors, judges and investigators, all the subjects of pre-trial investigation could form the united practice of pre-trial investigation. It is suggested in the report to foresee the measures which would help improve the organization of the subjects of pre-trial investigation in a way that all the subjects of pre-trial investigation could form equal practice of the organization of pre-trial investigation and criminal acts qualification (investigation) practice<sup>35</sup>. In order to recognize pre-trial investigation in a more effective way and taking into the account the proposed recommendations, the interagency special training module program<sup>36</sup>, called "The activity of law enforcement institution officers" is devoted to form special competences of law enforcement officers (judges, prosecutors, pre-trial investigation officers and other law enforcement institution officers, if needed) while forming the united and advanced practice in criminal acts qualification (investigation), organizing and executing the pre-trial investigation, as well as hearing criminal cases in court.

## CONCLUSIONS

The results of the recent Lithuanian scientific researches indicate that the organization of pre-trial investigation remains one of the most important development trends in the tactics of criminalistics. The changes of the criminal procedural norms, regulating the organization of pre-trial investigation, influenced the new concept and content of this organization process. During the course of change of the concept of pre-trial investigation organization new features of this process emerge: organization of pre-trial investigation is affected not only by organizational technical measures, but also definition of qualification and competence of subjects of pre-trial investigation, influence of personal qualities on the professional activities, motivation of these entities, cooperation features, possibilities for strengthening of interagency cooperation in the area of regular activities and training.

Changing approach to the organization of pre-trial investigation in context of tactics of criminalistics allows forming a new view to the system of the organization of pre-trial investigation: interdisciplinary philosophy (concept) of this process – based on integral knowledge of criminalistics, criminology, criminal proceedings, educology, psychology and modern management.

At present, most of problematic issues related to organization of pre-trial investigation are in

33 Order of the Lithuanian Police Commissioner General "On the approval of the special training module programme "Criminal police activities" of 19 March 2013, No. 5-V-221.

34 National audit report of the National Audit Office of Lithuania "Whether the preconditions for the effective organization of pre-trial investigation are framed" of 20 December 2012. [interactive]. [seen 2013-10-31]. <[http://www.vkontrole.lt/audito\\_ataskaitos.aspx?tipas=2](http://www.vkontrole.lt/audito_ataskaitos.aspx?tipas=2)>

35 On 23 of May, 2013 The meeting held in the Prosecutor General's Office of Republic of Lithuania where the representatives from the National Courts Administration, the Prosecutor General's Office of the Republic of Lithuania and the Lithuanian Police took the decision to make the interagency special training module programme "Activities of officers of law enforcement institutions".

36 Order of the Prosecutor General of the Republic of Lithuania and the Lithuanian Police Commissioner General "On the interagency special training module programme "Activities of officers of law enforcement institutions" of 14 October 2013, No.I-259/5-V-808.

progress: the competence description of police officers and other police system employees, also the competence acquisition and updating procedure order were confirmed. The new module of further improvement program for pre-trial investigation police officers in criminal and public police as well as inter-institutional special training module program was prepared. However, there is still a need to carry out empirical research in Lithuania, which will allow better revealing ties between personal qualities, professional competence and professionalism of pre-trial investigation officers, as well as to create a reliable profile of prospective pre-trial investigation officer.

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## USE OF COMPUTER PROGRAMS IN ANALYSIS OF TRAFFIC ACCIDENTS

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**Abstract:** Taking into account the basic characteristics of a traffic accident, it's complex and specific event, of which usually there are no reliable data on the mode of origin, it is very difficult and sometimes impossible to reliably identify and calculate all the parameters related to the occurrence of accidents. In addition, the modernization of vehicles and vehicle protection system, the complexity of a reliable establishing and analyzing accidents, without the use of modern technologies is further complicated. Without reliable data about the characteristics of the vehicle, as well as experimental data depending on the degree of impairment of speed for a particular vehicle, it is quite unreliable determine the impact parameter in concrete terms. All this points to the importance of applying modern tools for the analysis of traffic accidents. Classical methods of analysis of traffic accidents based on the application of common knowledge legality of the vehicle, as well as experimental data from the older models of vehicles, which makes the method substantially inaccurate and unreliable in these days. Modern computer programs, traffic accident analyze on the known laws of motion of the body, where in the analysis includes information on specific vehicles and specific characteristics (weight distribution, suspension, body type ...), as well as possibly any changes to the car (it is possible to include additional in the analysis). The advantage of these programs, beside more accurate and reliable analysis of traffic accidents is also the ability to display (visualization of three-dimensional) flow of traffic accidents, which makes it easier assessment of how occurrence of traffic accident by all users (judges, prosecutors ...), not just traffic-educated professionals.

**Keywords:** analysis of traffic accidents, computer programs, PC Crash.

### INTRODUCTION

By report of The main service for audit of Republic of Serbia, every year on the roads in the world dies about 1, 3 million people and become injured about 50 million people. Traffic accidents are third cause of death.<sup>1</sup> When we look at these numbers it is obviously that we need new strategy against the increased number of traffic accidents. As we need new way to reduce number of traffic accidents, we also need new methods to find out what is the main cause of the specific traffic accident. Automotive industry can't produce safer cars if it is not known what makes their cars unsafe.

If we took a survey which the main goal was to show how the automotive industry has progressed over the years, we would probably come to the conclusion that the automotive industry has developed through scientific developments. A well-known fact is that all the achievements of science are used in some field of industry. The automotive industry is one of the first industries that accepts and applies the most advanced and sophisticated technology that science develops.

Analysis of traffic accidents is a complex process that requires multi-disciplinary knowledge and the possibility of comparative analysis. The latest models of cars are becoming more computerized, so it can be said that a driver's role to keep car moving is much smaller. That is why today we cannot use the methods of analysis of traffic accidents that we used earlier. Together with the development of the automotive industry and the achievements that they use to make cars safer, faster, more comfortable, economical, it is essential that the methods of analysis of

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<sup>1</sup> [www.gsr-rs.org](http://www.gsr-rs.org)



accidents develop. With old methods we can get answers, but they aren't complete and we have a greater opportunity to make a mistake. This is a luxury we cannot afford, when for a result we have one more folded human life.

The use of software programs in the analysis of accidents began in the early seventies of the last century.<sup>2</sup> Since PCs become more accessible for the community, interest in the use of computer programs for analysis of traffic accidents begins to grow. Today, these programs are less commonly used in the analysis of traffic accidents, because people are not familiar enough with this way of resolving problems. Besides being time-saving, when is properly used computer software can provide more authentic and more trustworthy accident analysis. Because of that, it is necessary to use more computer programs, which are now high-quality method of analyzing traffic accidents.

### “ THE OLD METHODS” OF ANALYSIS TRAFFIC ACCIDENTS

The basis for the analysis of traffic accidents is each material collected from the scene of an accident, by officials who are adequately trained to do so. This is equally important for the implementation of SN analysis, both conventional methods and modern - computer. When we are at the scene of traffic accident we are obliged to do fixation. Fixation of scene of the traffic accident we do by introducing different methods like: exemption methods, method of photographing and video recording, measuring graphical and verbal method.<sup>3</sup>

### METHOD OF PHOTOGRAPHING AND VIDEO RECORDING

Photographing the scene of the traffic accidents aims to permanently record object that is recording.<sup>4</sup> With photography we are trying to show all relevant elements of traffic accidents. When we say important elements we think of: vehicle damage, road damage and objects at the road. We use high resolution aerial photography to provide an untouched overhead view of the entire accident scene. Photography is build with next groups of photos:



Photo 1: Example measurement system

1. Wider set the scene, from all approaches to the site;
2. Closer look of the site, from all approaches to the site;
3. The relative position vehicles, traces and objects of traffic accidents;
4. Set of traces and objects;
5. Set vehicles;
6. Appearance of dead people and animals;
7. Other important details ( for example: exclusion of cases, important details of road and objects... ).<sup>5</sup>

<sup>2</sup> Vujanić, M., Milutinović, N., 2012 year, Primjena savremenih softverskih alata za analizu saobraćajnih nezgoda, XI Simpozijum “ Analiza složenih saobraćajnih nezgoda i prevare u osiguranju”, Zlatibor, page 126.

<sup>3</sup> Nešić, M., Lipovac, K., Malešić, S., 2011. year, Savremeno vršenje uviđaja saobraćajnih nezgoda u funkciji unapređenja analize saobraćajnih nezgoda, X Simpozijum “ Analiza složenih saobraćajnih nezgoda i prevare u osiguranju”, Zlatibor, page 147.

<sup>4</sup> Cvijan, M., Trifunović, M., 2012. year, Značaj fotografisanja za analizu saobraćajnih nezgoda, XI Simpozijum “ Analiza složenih saobraćajnih nezgoda i prevare u osiguranju”, Zlatibor, page 108.

<sup>5</sup> Nešić, M., Lipovac, K., Malešić, S., 2011. year, Savremeno vršenje uviđaja saobraćajnih nezgoda u funkciji unapređenja analize saobraćajnih nezgoda, X Simpozijum “ Analiza složenih saobraćajnih nezgoda i prevare u osiguranju”, Zlatibor, page 147.

### MEASURING GRAPHICAL METHOD

Applying of the sketching method involves making freehand drawings the scene of traffic accidents in which is quoted everything that is measured and how is measured. In practice we have three types of measurements:

1. Coordinate method;
2. Triangular system of measurement;
3. Combined system of measurement.<sup>6</sup>

After drawing a sketch we make situation plan to scale that is commonly used as a basis for temporal and spatial analysis of traffic accidents. In fact, as a site plan drawn to scale and show a correct position of the existing tracks, and on it can be performed analyzes related to the movement of the vehicle before and after the collision.<sup>7</sup>



*Photo 2: Appearance of the vehicle after traffic accident*

### VERBAL METHOD

All important details about accident are noted during the investigation. When we come at the police station, we write a Record of the scene, which is part of investigating documentation. This is written trace of traffic accidents.

### ANALYSIS OF THE MATERIAL ELEMENTS OF A TRAFFIC ACCIDENT

The described methods are used to collect data from the accident and are the basis on which professionals and experts conduct expert analysis and identify gaps participant accident. In the classical analysis of traffic accident these data are mutually compared, analyzed, and based on well-known, general patterns are determined fails participants in the accident. Therefore, the data collected in the field are analyzed individually (photos, sketches, notes ...), then compared and matched to help expert to create a picture of how accidents can happen, and then perform calculations and determine the technical parameters of the collision. In technical calculations are used the principles that are formed on the basis of experiments and for all established laws in the literature we have been given a certain tolerance. Taking into account the period, as well as the characteristics of the vehicle, in which the tests are carried out and date values any variations in the laws, leads to a situation, that the calculations performed in this way does not provide enough reliable data on traffic accident. With unreliable parameters traffic accident is not possible to make a quality time spatial analysis, and this cannot be a reliable and accurate way to determine gaps participant accident.

Often some important elements for the analysis of traffic accident are identified only by a qualified person, and these elements are not recognized in the investigation. Given that such elements are not fixed during the crime scene investigation, and with traditional methods is not possible to subsequently determine their position in relation to other traces. The impossibility of a reliable determination of these elements is crucial for the analysis of traffic accident and this to determine the failure of the participants, but the classical methods expertise cannot be reliably determined or subsequently re-measured. Modern software packages such as PC CRASH are accompanied by programs for rectification of images, so that in addition to analyzing the flow

<sup>6</sup> Tešić, M., Gogić, N., 2012. year, Preporuke za primenu sistema merenja na licu mjesta saobraćajne nezgode, XI Simpozijum "Analiza složenih saobraćajnih nezgoda i prevare u osiguranju", Zlatibor, page 118.

<sup>7</sup> Тешић, М., 2011. година, 2011. year, Обрада трагова саобраћајних незгода са аспекта мерења, X Симпозијум „Анализа сложених саобраћајних незгода и преваре у осигурању“, Златибор, page 160.

of traffic accidents and possible reconstruction of the images and reading distances on existing images, which can be very important in the analysis of traffic accidents.

### COMPUTER-PROCESSING TRAFFIC ACCIDENTS

Computer-processing of traffic accidents had its start in the U.S., where has been developed first program, whose role was computer analysis of collision. Program from this area are based on SMAC and CRASH methods. Slowly but steadily these methods gain advantage over old methods analysis collision. If we use them correctly, they can be of great importance in the analysis of traffic accidents. Using them, we save our time and money.

Taking into account possibilities of the program, they can be divided into:

1. Program for the genetal analysis;
2. Programs for vehicle dynamics;
3. Programs for dynamic collision;
4. Programs for dynamic man in the vehicle;
5. Programs for photography;
6. Programs for animation.<sup>8</sup>



Photo 3: First "safe" vehicle

Based on division of the program, we can conclude that each of them is developed for individual elements of complex analysis and different types of analyzes in a crash. Because of that, it must be emphasized that computers do not perform the analysis, but with their speed, they allow experts to get necessary data, which are more accurate and detailed than those that we can get using the old methods.<sup>9</sup>

In practice we mostly use: programs for vehicle dynamics and programs for dynamic collision. The beginnings of research in this area are associated with in 1952. year when is developed program named Automotive Crash Injury Research Program, ACIR by John O. Moor. His research resulted in creation of the first safe vehicle.

His research has shown that the improvement of locks, dashboards, and seat belts can greatly reduce injury to occupants.<sup>10</sup>

#### “PC CRASH“ PROGRAM

70s of last century U.S. department of Transport developed software algorithm that is called CRASH - Calspan Reconstruction of Accident Speeds on the Highway. CRASH is developed with purpose to accomplish greater accuracy and reduce the possibility of errors in analysis physically measurable evidence. His distinctive feature is reflected in the possibility of determining the direction of travel and the speed diference, all that based on physical evidence.<sup>11</sup>

CRASH is third prorgam which is developed by CALSPAN laboratory, U.S. department of Transport. The output from CRASH depends on the amount of information supplied. The minimum amount of information is the vehicle weights and a description of vehicle damage. The CRASH program is used to reconstrust single- and two-vehicle accidents. CRASH will estimate the severity of impact by computing a qunatity called the speed change, or  $\Delta V$  ( change in occupant compartment velocity during the impact phase, also approximately the speed at which an unbelted occupant strikes the vehicle interior).<sup>12</sup>

8 Vujanić, M., Milutinović, N., 2012. year, Primena savremenih softverskih alata za analizu saobraćajnih nezgoda, XI Simpozijum " Analiza složenih saobraćajnih nezgoda i prevare u osiguranju", Zlatibor, page 126.

9 <https://www.ncjrs.gov/pdffiles1/Digitization/120739NCJRS.pdf>, retrieved on 16.12.2013. year.

10 [http://en.wikipedia.org/wiki/Automotive\\_Crash\\_Injury\\_Research\\_Center](http://en.wikipedia.org/wiki/Automotive_Crash_Injury_Research_Center), retrieved on 15.12.2013. year.

11 <http://www.edccorp.com/library/TechRefPdfs/EDC-1010.pdf>, retrieved on 15.12.2013. year.

12 <https://www.ncjrs.gov/pdffiles1/Digitization/120739NCJRS.pdf>, retrieved on 16.12.2013. year.

CRASH use two approaches in analyzing traffic accidents:

1. Is based on the final results of the accident which is determined based on the trace, damage on the vehicle and other tangible evidence which talk about what happened. This method we use when we don't have eyewitness and when all participants died in traffic accidents. This method have three stage:
  - Determine the mutual position of the vehicle;
  - The position of the vehicle relative on the road;
  - Determine speed and position of the vehicles just before the collision.
2. Assessment of the situation and defining assumptions, based on that concluding about driver's behavior and vehicles to determine whether the estimation of the situation coincides with the well-known outcome of a traffic accident. This method is used when we have contradictory statements of witnesses, so one of them we use as the assumption. The assumption that show us as most likely with the well-known outcome of a traffic accident, is considered to be most probable.<sup>13</sup>

In his development mention program has been changed more than once, so today we have number of versions. With each next has tried to remove disadvantages of the previous. In 80s CRASH2 was renamed in CRASH3. After few years, updating the coefficients of stiffness of the vehicle body and facilitating the use of vehicles with some stiffness coefficient CRASH became SMASH - Simulating Motor Vehicle Accident Speeds on the Highway. CRASH program which is based on the energy and impulse methods later is been updated more times, depending from researchers sought to enhance its capabilities.<sup>14</sup>

In the rest of this paper we will show opportunities: PC CRASH and Virtuel Crash.<sup>15</sup>

**PC CRASH** is program for simulate the collision and vehicle movement (of the cars, buses, trucks, sets of vehicles, operating machinery, vehicles with a single track and vehicles of all sizes and dynamic characteristics), and the collision of vehicles and other vulnerable road users (pedestrians, cyclists, animals ...). This program calculates the parameters of the collision and it allows users to perform the correction of parameter collisions, and in order to obtain the parameters with the smallest error in relation to the available input parameters, determined at the scene of a traffic accident. So, for a vehicle collision, there is an option where program itself, for the given parameters and the stop position of the vehicle, shall optimize the desired and selected parameters so that the error of the analysis was reduced to an acceptable level (it is estimated up to 10% deviation from the ideal position). Also, there is an option in which expert have the possibility to correct the parameters of impact, which program continues to processes and outputs results and the position. For the analysis of collisions with vulnerable participants in an accident there is no automatic optimization program, but an expert must perform the correction parameter collisions.

During all of these tests program takes into account the characteristics of the vehicle that is involved in a car accident, and has the possibility of correction of some parameters if they deviate from the factory for a vehicle that was involved in a collision, and this also reduces the error, a reliability analysis raises to a higher level. Also, when calculating the program takes into account vehicle load and eventually placed the burden on the vehicle and its location. In the analysis of collisions with vulnerable road users program has the ability to use specific characteristics of participants (if available), such as height, weight, position at the time of the collision, and the like. It's very important to note that the program uses the relative positions of the vehicle body and the way it was in the time of the collision, and that with conventional methods cannot be taken into consideration.

With this program it is possible to perform analysis of accidents on a variety of surfaces,

<sup>13</sup> Đurić, T., Mitraković, N., 2008 year, *Prevenција saobraćajnih nezgoda na bazi analize pojedinačnih nezgoda*, Zbornik radova "Mjesto i uloga lokalne zajednice u bezbjednosti saobraćaja", Doboj, page 84.

<sup>14</sup> Vujanić, M., Milutinović, N., 2012. year, *Primena savremenih softverskih alata za analizu saobraćajnih nezgoda*, XI Simpozijum "Analiza složenih saobraćajnih nezgoda i prevare u osiguranju", Zlatibor, page 135.

<sup>15</sup> www.vestacenje.co.rs

shape and grip, and on which, in practice, accidents can happen. Often is the case that vehicle in crash leave road and moving the shoulder or other surface, and that the area has an uncharacteristic form and what all this program has as the ability to adjust the performance of the analysis. When the analysis of traffic accident was completed, output and flow of an accident can be displayed in two-dimensional and three-dimensional view. Also, beside good analysis, with this program we can constitute short AVI animation. The biggest advantage of this program is that the program prepare a report on all the parameters and coefficients regarding the performed analysis traffic accidents, and because of that, it is easily possible to check all the parameters that were used in the analysis and control of the analysis carried out traffic accident. This minimizes the possibility of errors in the analysis of traffic accident.

His good sides are:

1. Clear temporal and spatial representation;
2. Accuracy;
3. Verifiability;
4. Very good representation of the dynamics of the vehicle after the crash and temporal-spatial analysis;
5. Clear diagrammatic representation;
6. Perform the movement and collisions of all types of vehicles;
7. Extensive logistics environment;
8. Crashes with pedestrians;
9. Three-dimensional movement of the vehicle (tumbling, falls from a bridge, falls into channel, profound);
10. Simplified presentation of the process of the collision in comparison to the other programs the same purpose.

Bad sides are:

1. It is required time for analysis and simulation;
2. Hard manual;
3. Very slow animation performance;
4. Two-dimensional and three-dimensional image is of poor quality.

**Virtual Crash** is modern software for the simulation of traffic accidents, which is designed to be easy for the general use, and to overcome all so far identified systemic deficiencies and problems with the previous less complex program for analyzing traffic accidents. In this program in relation to the PC Crash is simplified setup parameters collisions, and is not required knowledge of a large number of parameters, as well as the increased possibility of visual changes to the vehicle. Virtual Crash supports all movements and all types of vehicles on all surfaces and terrain configuration. So far he has the best virtual display, especially three-dimensional. Unlike previously described program the Virtual Crash has a lower sensitivity, so fewer parameters can be adjusted and corrected when performing analysis of traffic accidents. With that in mind, and the results obtained in this program are less sensitive, with this the accuracy of the obtained analysis is to some extent reduced because there is no possibility to check the growing number of influential parameters on the formation of traffic accidents. So in relation to the PC CRASH data obtained in this program are less sensitive and therefore less reliable, but his output is closer to the display realistic-looking vehicles and acceptable to users and observers.

Good sides are:

1. Although he doesn't have manual, it is very easy to learn how to use it;
2. It is simple;
3. The speed with which ends in a complete situation is great, regardless of the number of participants, which vehicles and on what surfaces.

Bad sides are:

1. Lower settings sensitivity;
2. A smaller number of parameters of the impact that can be taken in the analysis;
3. Less reliable results due to the limited number of input factors.



In order to better understand the differences between the conventional method of calculating the parameters of the collision and modern computer programs, there is an example where the vehicle avoid a collision with another vehicle and as a result lost their stability and went off the road. Further movement of the vehicle hit a tree and stopped. By analyzing the resulting damage on the vehicle and the evaluation of the lost kinetic energy, as well as the length of distance traveled, the classic method is calculated speed of the vehicle at the time of response of drivers to avoid crashes by 45 km/h. The application of the computer program, which took into account the damages caused to the vehicle, the length of distance traveled and resistance along the way, as well as the characteristics of a particular vehicle speed is determined at the time of reacting to the driver avoid collisions of 48.5 km/h.<sup>16</sup>

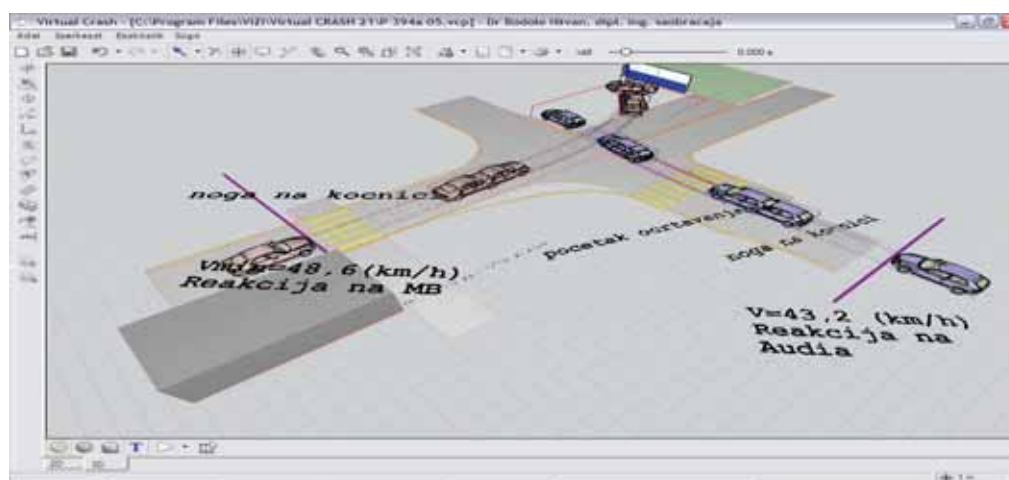


Photo 4: View of an open window in the Virtual Crash

Bearing in mind that the above example is relatively simple, and that the difference in speeds that are determined not significantly large, it just shows how the difference might be significant in complex traffic accidents, and especially in cases where determined speed is close to the limited speed of movement. In fact, in such cases the accuracy of the determined speed of some of the participants can directly decide the his failures, and time and cause further sanctions.

### ABUSE OF SIMULATION SOFTWARE FOR TRAFFIC ACCIDENTS

Before we start to discuss about the abuse, we must differentiate the concept of abuse from the misuse of the mentioned programs. Misuse means that the person don't have enough knowledge to use mentioned programs and to do exact analysis of traffic accidents. Here an expert does not have the intent to get incorrect results, but that is the result of his incompetence. If we say that someone abuse mentioned program, than we think that he has used him to get results that are similar to his private interests. In this situation he doesn't respect the most important principle of his work, and that is objectivity. The expert did the analysis of traffic accident by his interest rather than moral principles. This is big problem because we have few experts who use programs for simulation when they do analysis of traffic accidents. If the program is complicated, it leaves much more chances for abusing the results of expertise. Abuse may be the result of accidental or deliberate omission. Given that the court use expert when does not possess adequate knowledge of certain facts, he hired an expert witness in whose abilities have confidence. The problem arises when the chosen expert chooses to display the results biased. Because of the trust that the court has in him, he will not check the results, and the court is usually only mentioned with the necessary expert knowledge.

<sup>16</sup> www.vestacenje.co.rs retrieved on the 15.12.2013. year.



In order to avoid this, every program before his commercial must pass validation process. This is obligatory also because sometimes, we have dissatisfied party, and she in her complain as a primary reason quotes the reliability of the used program. Here validation process is the key how to show that the party was wrong.<sup>17</sup>

## CONCLUSION

Jack Strow said: „ We cannot fight with the crime in 21s century, if we use methods from 19s century.“<sup>18</sup>. This sentence can be applied also on the methods of analysis of traffic accidents. This means that we must develop our methods in accordance with the time in which we live and the level of development we must improve our methods of analysis traffic accidents. Conventional “old” methods give some results, but they are far from results what is expected by modern society. “ Old“ methods we must leave in the books as a reminder how we did this in old times, to show as what we have learn, how we have progress... These methods should not be forgotten and out of use, but they should not be given the same importance as modern methods, because their results are not at the same level of quality and precision as the results of modern methods.

With the development of modern automobile industry in vehicles is represented concept of introducing modern systems, which are based on the active mode setting and performance cars, and it's all based on the work computer. Bearing this in mind when analyzing the accidents is required the application of computers, which have the ability to analyze these vehicle characteristics, which enables more precise and reliable analysis of the accidents occurred and determine the parameters of an accident. In this way it is possible to obtain reliable data, which correspond to the actual traffic situation that was at the time and place of the accident, which greatly helps to define further the failure of participants.

Programs for analysis and simulation of traffic accidents enable a greater extent the application of these concepts, because in their databases have a significant number of properties of different kinds and types of vehicles, which significantly contributes to the quality analysis of traffic accidents. In addition to management of larger number of reliable data on each vehicle, these programs have the option of performing a large number of analyzes in a short time, which enables the reduction of errors in a given calculation. In this way, modern applications in a relatively simple way we can check various possible variants of the collision, and this make their mutual comparison and selection of the most reliable. Beside performing reliable analysis of contemporary programs also have the ability to visualize the analysis, which greatly facilitates the consideration of the circumstances of an accident, by all stakeholders, which often do not have the necessary knowledge of the traffic technical expertise. The most important advantage of modern software is easy verifiability of data and parameters that are crystallized in the analysis, which enables the verification of the reliability of the analysis of traffic accident. The development and modernization of these software packages in the future will increase the possibilities of analysis and will increase the number of parameters that can be seen in the analysis of traffic accident, which may affect the course of the accident.

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<sup>17</sup> Vujanić, M., Milutinović, N., 2012. year, Primena savremenih softverskih alata za analizu saobraćajnih nezgoda, XI Simpozijum “ *Analiza složenih saobraćajnih nezgoda i prevare u osiguranju*”, Zlatibor, page 146, 147.

<sup>18</sup> [http://prezentacije.mup.gov.rs/upravazaobrazovanje/aktuelno/b%202002/web\\_Bezbednost\\_5\\_2002.pdf](http://prezentacije.mup.gov.rs/upravazaobrazovanje/aktuelno/b%202002/web_Bezbednost_5_2002.pdf), retrieved 22.12.2013. year.

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Electronic resources:

1. <https://www.ncjrs.gov/pdffiles1/Digitization/120739NCJRS.pdf>
2. [http://en.wikipedia.org/wiki/Automotive\\_Crash\\_Injury\\_Research\\_Center](http://en.wikipedia.org/wiki/Automotive_Crash_Injury_Research_Center)
3. <http://www.edccorp.com/library/TechRefPdfs/EDC-1010.pdf>
4. <https://www.ncjrs.gov/pdffiles1/Digitization/120739NCJRS.pdf>
5. [www.vestacenje.co.rs](http://www.vestacenje.co.rs)
6. [www.gsr-rs.org](http://www.gsr-rs.org)
7. [http://prezentacije.mup.gov.rs/upravazaobrazovanje/aktuelno/b%202002/web\\_Bezbednost\\_5\\_2002.pdf](http://prezentacije.mup.gov.rs/upravazaobrazovanje/aktuelno/b%202002/web_Bezbednost_5_2002.pdf)



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**Abstract:** Using the shape of the outer ear as the unique and permanent human body structure in identifying people has been of interest during last few decades. The ear lobe offers a stable biometric characteristic that does not change much as we age. The earprints are becoming interesting when it comes to the crime investigation. Success of the current systems for the ear detection and identification is still limited to the controlled conditions within the laboratory. This paper analyzes the biometric characteristics of the ear and the opportunities it offers for human identification. A detailed review of the research conducted in the field of detection and identification of human ear was provided, as one of the physiological biometric characteristics of humans.

**Keywords:** Biometrics, Ear, Identification, Ear detection

**INTRODUCTION**

It is well known that certain characteristics of the human body such as face, iris, fingerprint, DNA, and so on are unchangeable and allow identification of the person.<sup>1</sup> These features represent the physiological biometric characteristics unique to each individual and can be used to confirm its identity. Likewise, these characteristics represent a substitute and are far safer variant of identification than password based.<sup>2,3</sup> Concerning the “measurable” human characteristics there are two different types that vary between individuals: physiological, identifying some physiological characteristic of a person, and behavioral, identifying a person by its typical unique behavior.<sup>4,5</sup> However, nowadays there are still some biometric characteristics that are a bit more considered and therefore more accessible ones. On the other hand, this should not diminish the importance of other biometrics, because their use and research are nothing but future of biometrics.

The issue of all possible aspects of differentiation, recognition and identification dates from the distant past. In the original tribal communities, members who had violated the rules of the tribe were often annotated with mutilation, scarring or stigma, so that everybody knew that those were displaced inhabitants, and usually, when recognized as such, were not accepted by other tribes. The expulsion from the tribe would mean certain death since one could not survive without fire, food and hunting tools. Similar forms of identification of murderers, thieves and immoral persons in medieval Europe, as well as even today are known.<sup>6</sup>

1 Le, C., *A Survey of Biometrics Security Systems*, 2011, <http://www.cs.wustl.edu/~jain/cse571-11/ftp/biomet.pdf>, viewed on 2 November, 2013.

2 O’Gorman, L., Comparing passwords, tokens, and biometrics for user authentication, *Proceedings of the IEEE* (vol. 91, no. 12), 2003, p. 2021-2040.

3 Prabhakar, S., Pankanti, S., Jain, A.K., Biometric recognition: security and privacy concerns, *Security & Privacy, IEEE* (vol. 1, no. 2), 2003, p. 33-42.

4 Sayoud, H., Biometrics: An Overview on New Technologies and Ethic Problems, *International Journal of Technoethics*, vol. 2, no. 1, 2011, p. 19-34.

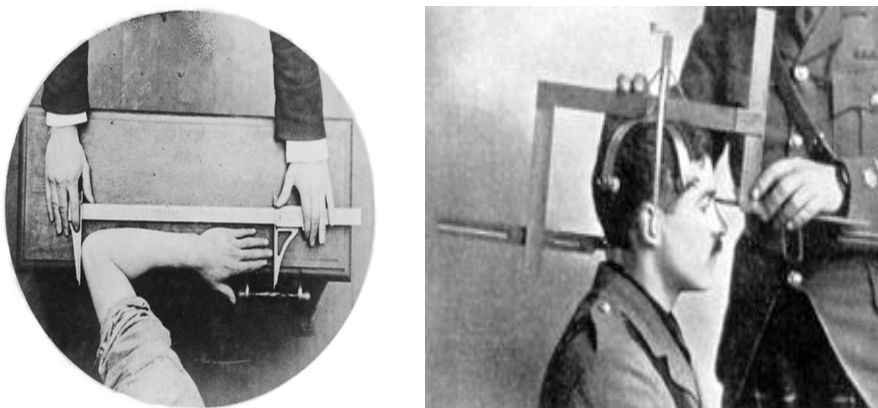
5 Perner, P., Combination of Physiological and Behavioral Biometric for Human Identification. Chap. in *Machine Learning and Data Mining in Pattern Recognition*, ed. Hossain, E., and Chetty, G., Springer Berlin Heidelberg, *Lecture Notes in Computer Science*, vol. 7376, 2012, p. 380-393.

6 Mašković, L.J., *Kriminalistička tehnika*, Kriminalističko-policijska akademija, Beograd, 2013.



Picture 1. Early civilization handprint images

Some identification methods were also used in the humane purposes, as found in written documents of the Assyrians and Babylonians where the proof of authorship of a document was confirmed by imprinted fingerprints. One of the oldest and most basic characteristics used for recognition was face.<sup>7,8</sup> Since the beginning of civilization, people used it for recognition of persons. The concept of recognizing people is visible for example in speech recognition (speakers), and in other examples of recognizing characteristics of everyday behavior. Other characteristics used for identification in the history of civilization are more formal. Some examples are: handprints on cave paintings (Picture 1), which are thought to be left by prehistoric man some 31000 years ago, fingerprints, which were used by early Chinese traders in order to confirm business transactions, in the same way as merchants did in Babylon about 500 years before Christ, and so on.<sup>9</sup> While in Western cultures biometrics was not applied until the late 19<sup>th</sup> century, Chinese used it since the 14<sup>th</sup> century. Researcher and writer named João de Barros wrote that Chinese used ink to prints newborns' hands and feet on the paper in order to differentiate children between each other.<sup>10</sup>



Picture 2. Anthropometric system

In the West, however, the identification was, for a long time, based mainly on the “photographic memory” until in 1883 a French police officer and anthropologist Alphonse Bertillon

7 Omidiora, E. O., Fakolujo, O. A., Arulogun, O. T., Aborisade, D. O., A Prototype of a Fingerprint Based Ignition Systems in Vehicles, *European Journal of Scientific Research*, vol. 62, no. 2, 2011, p. 164-171.

8 Graevenitz, G. A., Introduction to fingerprint technology, *A&S International*, vol. 53, 2003, p. 84-86.

9 Sayoud, H., op. cit., p. 16.

10 Sheriff, R.E., ed, 10<sup>th</sup> Workshop Proceedings, School of Engineering, Design and Technology, University of Bradford, Bradford, p. 16-19.

developed and introduced the anthropometric system (Picture 2), later known as Bertillonage.<sup>11</sup> It was the first precise, well-known system that was wide applicable in the identification of criminals. The system was based on a precise measurement of the width and length of the head and body, as well as on personal marks such as tattoos or scars. Bertillonage system has been well accepted until its shortcomings were becoming evident. Most problems included the different methods of measurement and variable measures.<sup>12</sup>

Subsequently, Western world police units have turned to methods that used fingerprints, as used in China for hundreds of years, already. In recent years, biometrics has come a long way since the simple fingerprinting. Today many different physiological and behavioral measurements are being performed. The use of biometrics is expanding nowadays, from a simple identification until verification used in important safety systems.

### PHYSIOLOGY OF THE HUMAN EAR

The ear (Picture 3) is a peripheral organ of hearing and balance (equilibrium processes).<sup>13</sup> Hearing plays a role in communication but also serves as a warning and orientation system. In the inner ear organ of Corti is located, as the most important part of the hearing organ since it converts sound waves that come from the environment through the external auditory canal to the tympanic membrane (eardrum) and inner ear to this organ that converts them into nerve impulses which are then transmitted through the cochlear nerve. In the inner ear the sense of balance exists, that also converts the changing in the position of the head and body into nerve impulses and sends it from the vestibular nerve to the central structures. Vestibular and cochlear nerve unite into the vestibulocochlear (auditory) nerve, which represents the eighth cerebral nerve.<sup>14</sup>

Many animals have ears. Structure and position of the ears are different from species to species. In insects, ears are in the form of sensors and some lizards (like salamander) hear through the chest walls and lungs. Snakes do not have external ear, but the middle and inner ear is well developed. Ears record sound (mechanical) waves and convert them into electrical signals, which are sent to a central structure where these signals are “decoded” and create a sense of hearing. The human ear can register the sound waves of frequencies from 16 to 20000 Hz.<sup>15</sup> With years this range narrows caused by the number of degenerative changes. Some animals, such as elephant, can register deeper frequencies (infrasound). Other animals, bats or dolphins, can register much higher frequencies than humans (ultrasound frequencies).<sup>16</sup>

Ear can register the location of the coming sound. Ear facing the sound source registers the sound earlier and louder than that on the opposite side. These differences in audibility are processed in the brain, and the information on the location from which the sound comes is obtained. However, to determine the exact location of the sound humans need only the senses of hearing, but also the sense of sight, while bats and dolphins require just the sense of hearing to accurately register the source. These animals emit ultrasonic signals, which are reflected from the surrounding objects. Reflected signals are being recorded by a very sensitive sense of hearing. In general, this is how sonar and radars do.

Organs of hearing and balance are quite complex system that has its own peripheral and central regions. Peripheral parts of the auditory system are used for the reception of mechanical waves and their conversion into nerve impulses. Peripheral parts of the vestibular system register the positions of the body in space and also convert these perceptions into nerve impulses that are sent to the central nervous system.<sup>17</sup>

11 Nagar, A. (2012). *Biometric Template Security*. (Doctoral dissertation), Michigan State University, Michigan, MI  
12 Vasiljević, I., *Biometrija*, Sveučilište u Zagrebu, 2007, [http://IgorVasiljevic\\_Biometrija.pdf](http://IgorVasiljevic_Biometrija.pdf), viewed on 2 November, 2013.

13 Alberti, P. W., *The Anatomy and Physiology of the Ear and Hearing*, World Health Organization, Geneva, 2001, [http://www.who.int/occupational\\_health/publications/noise2.pdf](http://www.who.int/occupational_health/publications/noise2.pdf), viewed on 1 November, 2013.

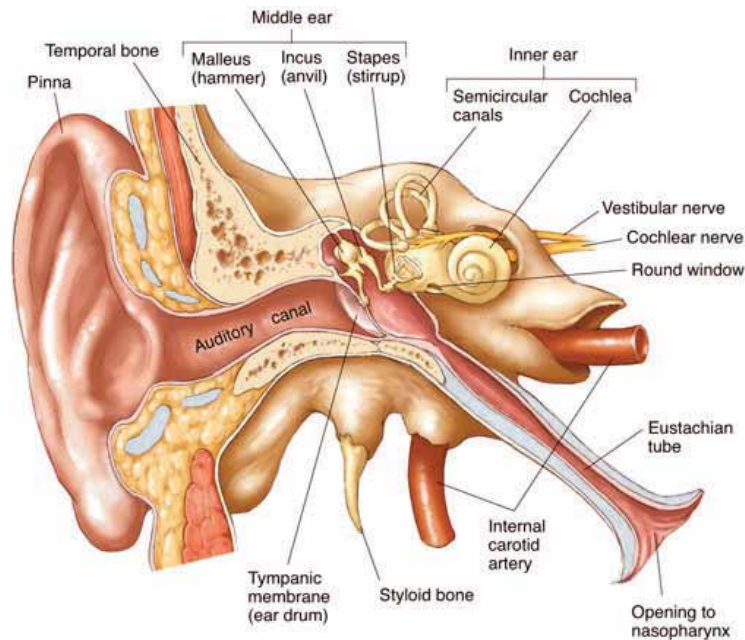
14 *ibid*

15 <http://hyperphysics.phy-astr.gsu.edu/hbase/sound/earsens.html>

16 Liu, Y., Rossiter, S. J., Han, X., Cotton, J. A., Zhang, S., Cetaceans on a Molecular Fast Track to Ultrasonic Hearing, *Current Biology*, vol. 20, 2010, p. 1834-1839.

17 Alberti, P. W., *loc.cit*.





Picture 3. Ear physiology<sup>18</sup>

Central parts of the auditory system are located in the brain. They process the information received from the periphery by which the brain creates the experience of hearing and body position in space. Central parts of the vestibular system communicate information from the peripheral vestibular system with other systems such as the visual system (eye), cerebellum and spinal cord.

The peripheral organ of hearing is the ear that is anatomically composed of outer, middle and inner ear.

The outer ear consists of lobe and external auditory canal (discussed later since it is of interest from the perspective of this paper).

Middle ear makes the eardrum<sup>19</sup> (at the bottom of the auditory canal, as the border between the outer and middle ear, divided into two parts *pars flaccida* and *pars tensa*), the tympanic cavity, auditory ossicles, muscles of the middle ear and mastoid cavity. From the outer ear canal to the tympanic cavity, eardrum consists of three layers: *stratum cutaneum*, *lamina propria membranae tympani*, *tunica mucosa*. Middle ear is connected to the pharynx with Eustachian tube.

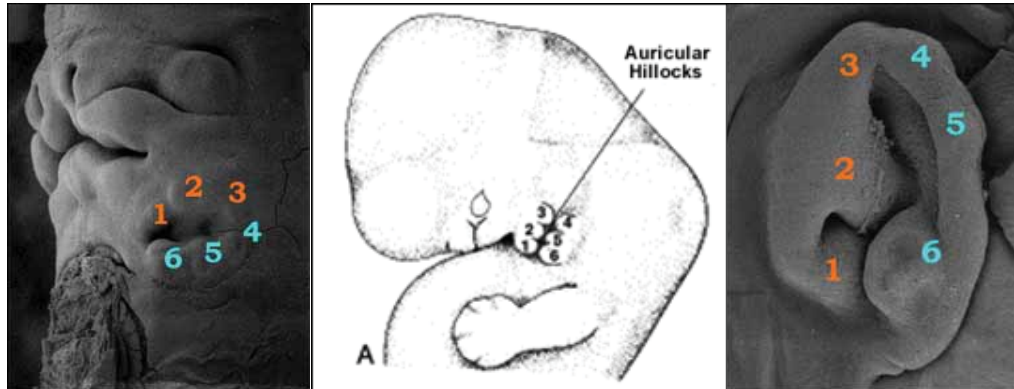
The inner ear consists of the vestibular labyrinth consisting of the semicircular canals and the vestibular nerve and the Cochlea. Vestibulocochlear nerve also belongs to the peripheral region of hearing.

Human ear develops between the fifth and seventh week of pregnancy. At this stage of pregnancy, the perforation of the lips and holes in the nostrils and ears of the embryo become visible. The human ear is derived from 6 surface hillocks (auricular hillocks) which develop in the 5<sup>th</sup> week of the embryonic development. Between 6 and 9 weeks of development, these hillocks grow, receive various shapes and are gathering in order to set up the structure of the outer ear. Also, the ear changes its location – originally on neck, moves cranially during mandible development.<sup>20</sup> Although there is still disagreement regarding the precise embryology of the outer ear, the overall development of the ear during pregnancy is as follows:

<sup>18</sup> <http://www.biographixmedia.com/human/ear-anatomy.html>

<sup>19</sup> Alberti, P.W., loc.cit.

<sup>20</sup> Abaza, A., Ross, A., Herbert, C., Harrison, M. F., Nixon, M. S., 2011. A Survey on Ear Biometrics, *ACM Transactions on Embedded Computing Systems*, vol. 39, no. 3, 2013.



Picture 4. The development of the human ear<sup>21</sup>

1) The embryo produces the first group of embryonic cells that serve as the basis for the production of the part of the body or organ. Two of these groups, called the first and second pharyngeal arch, form six elevated tissues, also called auricular hillocks, during the fifth week of development. Picture 4 in the middle shows the outline of the embryo with six auricular hillocks, marked from 1 to 6. Picture 4 on the left shows the growth and the development of the hillocks after 6 week of embryonic development.

2) In the seventh week, auricular hillocks begin to grow, to take different shapes and to combine, thereby producing the final shape of the ear, which gradually takes more lateral and cranial position than that of the side of the neck. By 9<sup>th</sup> week (Picture 4, right) shape of the hillocks is recognized as a human ear. The hillocks 1-3 form Arch 1 (*tragus*, *helix*, and *cymba concha*) while hillocks 4-6 form Arch 2 (*antitragus*, *antihelix* and *concha*). Forensic science literature states that the development of the ear after the first four months after birth is extremely linear. The rate of elongation is about five times higher than normal over a period from 4<sup>th</sup> month to 8<sup>th</sup> year of age followed by constant elongation until about 70<sup>th</sup> years of age, when it increases again.<sup>22</sup>

### EXTERNAL BIOMETRIC CHARACTERISTICS THE EAR - LOBE

Lobe is wrinkled skinny and cartilaginous funnel shape organ. Lower, a much smaller part of the lobe is soft since it does not contain cartilage and is called lobule (*lobulus auriculæ*). Lobe is placed on the side of the skull, between the mandibular joint and mastoid bone. The lobe has two different sides, inner and outer. The inner side of the lobe is convex and is turned medially and backwards. On this side, and on the outer side, a variety of valleys and hills which do not have a large significance. The structure of the lobe consists of skin, cartilage of the lobe and partial connections and muscles. The skin of the lobe covers the cartilage that is particularly fond of outer side. Skin has tiny and rare hairs, except on the inner side of *tragus*, where the strong and long hairs exist, and is called *tragi*. The cartilage of the lobe (*cartilago auriculæ*) makes a solid foundation of the whole lobe, except in the area of the *lobule auriculæ*, which does not contain cartilage. On its front side cartilage of the lobe connects with the cartilage of the outer ear canal (*cartilago meatus acustici*). The cartilage of the lobe is flexible. It generally has the same valleys and hills and lobe, but more pronounced. The outer side of the ear as a whole is concave and shows many valleys and hills. In its central part it is carved into a large and deep pit, which is called the *concha auriculæ* that leads to the outside channel. In front of the *concha auriculæ* and the opening of the outer ear canal triangular protrusion (*tragus*) exists. With its base *Tragus* fends to a facial skin, while its apex is covers, more or less, the entrance into the auditory canal. Below *concha auriculæ* is the outer side of the aforementioned *lobulus auriculæ*.

<sup>21</sup> ibid

<sup>22</sup> ibid

Geometric characteristics of the ear (Picture 5) are described over 9 prominent points. These points are the basic characteristics of a person through the ear recognition, and are the basis of biometric identification of individuals.

- 1) Helix
- 2) Lobule
- 3) Antihelix
- 4) Concha
- 5) Tragus
- 6) Antitragus
- 7) Crus helix
- 8) Triangular fossa
- 9) Incisure intertragica



Picture 5. Geometric characteristics of the ear

## RECOGNITION OF PERSONS USING BIOMETRIC CHARACTERISTICS OF THE EAR

Identification of persons based on biometric characteristics of the ear is a relatively new method of biometrics. Characteristics of the ear are for many years being used for identification in forensics.<sup>23, 24, 25</sup> The ear (Picture 6) is stable biometric characteristics and does not change much with age. Ear has all the features that biometric characteristics should have, such as uniqueness, universality and persistence.

Identification of people based on their ear characteristics has received considerable attention in the literature, contributed by number of reasons. First, during ear recognition the problems related to the other biometrics, such as face recognition is omitted. Further, the identification of the ear is the most promising candidate for combination with face-to-face recognition in context from different perspectives. Also, the ear can be used to identify people with the help of video surveillance in cases when a person's face is partially or completely hidden.



Picture 6. The human ear

<sup>23</sup> Abaza, A., Ross, A., Hebert, C., Harrison, M. A. F., Nixon, M. S., A survey on ear biometrics. *ACM Computing Surveys*, vol. 45, no. 2, Article 22, 2013.

<sup>24</sup> Jain, A. K., Ross, A. A., Nandakumar, K., Additional Biometric Traits, *Introduction to Biometrics*, 2011, p. 175-208.

<sup>25</sup> Nixon, M. S., Bouchrika, I., Arbab-Zavar, B., Carter, J. N., On use of biometrics in forensics: gait and ear. At European Signal Processing Conference, Aalborg, Denmark, 2010.

Although current systems for the ear detection and identification have reached a level of maturity, their success is limited to controlled conditions within the laboratory.<sup>26</sup> In addition to changes in lighting the problems that arise in the outdoor environment may be the ear hair covering, the ear symmetry, classification and individuality of the ear, etc.

People have used body characteristics for thousands of years in order to recognize each other. With application ranging from forensics to national security, biometrics is gradually becoming an integral part of modern society. The most common biometric systems are those which are based on features that people use for identification, such as fingerprints and facial image, and which have the greatest market share. More recently, iris biometrics is used in large systems to control identity (such as border crossings). However, many other human characteristics are studied as possible biometric traces to identify people. The structure of the ear is one of these biometric traces, since it was noticed that the geometry and shape of the ear varies greatly among individuals. The ear is a prominent and visible feature when a person is profile observed, and hence can easily be taken from the video or photo. Picture 7 shows the profile of certain individuals which ear is clearly visible in comparison with the face. The aim of this paper is to extend previous examinations and investigations in a manner that will:

- 1) Add reference to available databases that are suitable for the study of ear recognition,
- 2) Describe the effects of ear recognition in multibiometric systems, and
- 3) Describe open research problems in the field of ear biometrics.



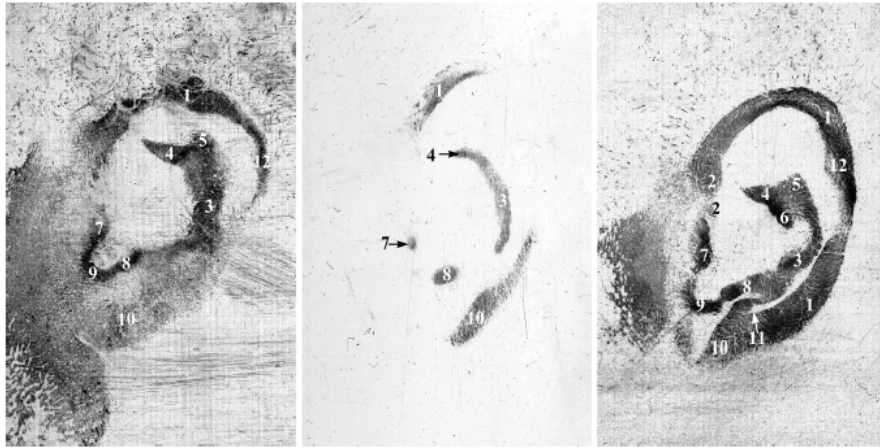
*Picture 7. Ear of the person's profile image*

It is commonly stated that the ear print must be unique, as structure of the ear is unique. This type of thinking is challenged by others, based on the fact that the high variability of three-dimensional coiled body organs do not necessarily imply high variability of two-dimensional mark, printed by that organ. Parts of the ear usually found as earprints are *helix*, *antihelix*, *tragus*, and *antitragus* (as shown in Picture 8). Specific details of these structures may contribute to the individualization of ear prints. These details include notches and corners of embossed characteristics, position of moles, wrinkles and folds and the position of the pressure points.

However, the individualization is confronted by several factors that cause a significant variation in the prints of the same ear:

<sup>26</sup> Jain, A. K., Ross, A. A., Nandakumar, K., loc. cit.





Picture 8. Common earprint parts

- Deformation of variables caused by the ear force applied over the surface while listening
- Ear and surface contact time
- Decorative ear modifications, such as piercings
- Changes in the shape and size of the ear due to the aging

Due to these factors, even two earprints of the same ear are not completely the same. In order to recognize the earprint as biometrics within the forensic science individual variations of earprints must be distinguished. This is still an open and active field of research. French criminologist Alphonse Bertillon recognized the potential of the human ear for personal identification and advocated for it even in 1890s. He wrote: *“The ear, thanks to these multiple small valleys and hills which furrow across it, is the most significant factor from the point of view of identification. Immutable in its form since birth, resistant to the influences of environment and education, this organ remains, during the entire life, like the intangible legacy of heredity and of the intra-uterine life”*.<sup>27</sup>

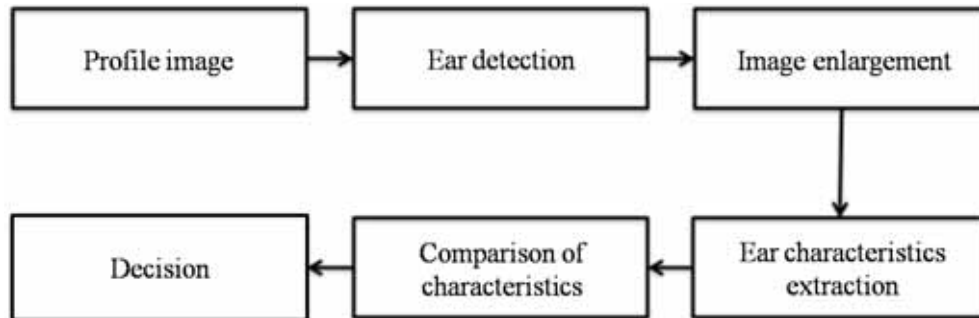


Picture 9. Earprint discovering

<sup>27</sup> R. W. McClaughry, *Signaletic Instructions: Including the Theory and Practice of Anthropometrical Identification (1896)*, ed. Bertillon, A., The Werner Company, Chicago, 2008.

Bertillon used a description of some of the measures as part of his ear Bertillonage system that is used to identify criminals. Earprints (or ear marks) are the traces of the external ear secretions (Picture 9) that occur when someone puts an ear to the wall, door, window or any other hard surface. They are found in up to 15% of criminal cases. There were several trials in the U.S. and other countries where the earprint is used as the physical evidence. However, some of the judgments that were based on earprint proofs were changed.

The main stages of the classic ear recognition are shown in Picture 10:



Picture 10. The stages of the classic ear recognition

1) Detection of the ear (segmentation): The first and most important step is the localization of the position of the ear on a particular photo. Then the rectangular constraint is commonly used in order to indicate the spatial extent that the ear takes on a given image. Ear detection is a critical component, since errors at this stage could jeopardize the usefulness of biometric systems.

2) Normalization and ear enlargement: in this phase, the detected (segmented) ear is a subject of a routine magnification because it improves the image fidelity. Also, the ear images may be subject to certain geometric or photometric correction in order to facilitate the separation characteristics and comparisons. In some cases, rounded line that matches the shape of the outer ear can be extracted.

3) Extracting characteristics: While the segmented ear can be directly used in the comparison process, most systems allocate a set of characteristics of ear that are most important. Extracting characteristics is process by which a segmented ear is reduced to a mathematical model (e.g. characteristic vector) that summarizes the discriminant information.

4) Comparison: Characteristics extracted in the previous phase must be compared with those found in the database to determine the identity of the ear with the input image. The simplest comparison involves comparing the results of a whole generation of sets of characteristics that are related to two photographs of ears. The result of comparison shows the similarity between the two images.

5) Decision: In the decision phase, the result of the comparison is used when making a final decision. In the case of verification, the information output is “yes” or “no”: the first indicates an exact match, and the other intruders. During identification, the output is a list of potential identity matching, classified in accordance with the result matching.

One of the first systems for ear recognition is Iannarelli’s system that was originally created in 1949.<sup>28,29</sup> This is a manual system based on 12 measures, such as those shown in Picture 11. Each image of the ear is edited so that the lower end of the standardized vertical leads to the upper line of the local part of the ear, while the upper end touches the outline of *antitragus*. Then

28 Mohan, S., Kumar, S. S., eds, Proceedings of the Fourth International Conference on Signal and Image Processing 2012, vol. 2, Springer, India, 2013, p. 137.

29 Archibald, N., Cullen, L., Bikker, J., Identification from Soft Tissues. Chap. in *Forensic Anthropology: 2000 to 2010*, eds. Black, S., Ferguson, E., Taylor & Francis, Boca Raton, 2011.



the *crus helix* is detected and used as a central point. Vertical, horizontal, diagonal and anti-diagonal lines are drawn from the center point to make up the intersection of internal and external folds on the surface of the ear. From these sections 12 measures that are used to represent the ear are performed.



Picture 11. Iannarelli's system measures

Fields et al.<sup>30,31</sup> attempted to identify newborn babies in hospitals. They perform a visual assessment of 206 groups of ear photos and came to the conclusion that the morphological constancy of the ear can be used to determine the identity of the newborn babies. There is currently no commercial biometric system for automatic identification or verification of individuals through their ear biometrics. Burge and Burger<sup>32</sup> gave one of the most cited biometric methods. They located the ear so they used deformable contours in presenting pictures of gradients using the Gaussian pyramid. Then they construct a graphical model based on edges and curves of the ear, and graphic-based authentication algorithm for matching. But, no results of system performance were reported.

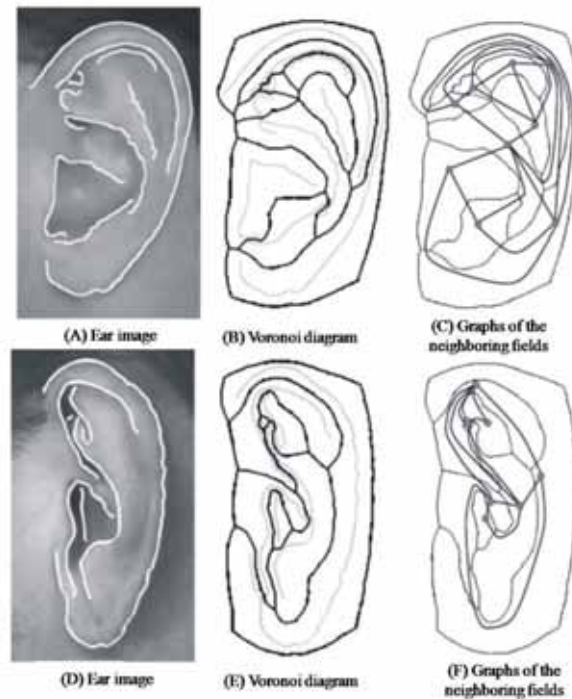
From 1998 to 2000 some automatic ear biometric system through Voronoi diagrams<sup>33</sup> of curved segments were introduced (Picture 12). The algorithm based on the comparison of diagrams for authentication is used, which takes into account possible erroneous curves that are causing for example light, shadow and occlusion.

30 Bharadwaj, S., Bhatt, H. S., Singh, R., Vatsa, M., Singh, S. K., Face Recognition for Newborns: A Preliminary Study, In: *Fourth IEEE International Conference on Biometrics: Theory Applications and Systems*, vol. 27-29, 2010, p. 1-6.

31 Tiwari, S., Singh, A., Singh, S. K., Fusion of Ear and Soft-biometrics for Recognition of Newborn, *Signal & Image Processing: An International Journal*, vol. 3, no. 3, 2012, p. 103-116.

32 Abaza, A., Hebert, C., Harrison, M.A.F., *Fast Learning Ear Detection for Real-time Surveillance*, In: *Fourth IEEE International Conference on Biometrics: Theory, Applications and Systems*, 2010, p. 1-6.

33 Antakis, S., *A Survey on Ear Recognition*, University of Twente, The Netherlands, 2009.



Picture 12. Voronoi diagrams

Moreno et al.<sup>34</sup> were the first to describe a completely automated system for ear identification. They have used multiple characteristics and combine the results of the several neural classifiers. Their vector included external point of the ear, shape and creases, as well as micro features extracted by compression of network. In order to test this system, two sets of images were required. The first group consisted of 168 photographs depicting 28 subjects, with 6 images per subject. The second group consisted of 20 photographs depicting 20 different individuals. Later, Mu et al. (2004)<sup>35</sup> extended this method. They are presented the vector of the ear characteristics as combination of the external ear shape and internal structure of the ear. Then they used a neural network for classification. This method can be considered a simplified automatization of Iannarelli's system. Yuizono et al.<sup>36, 37</sup> approached the problem of ear recognition based on photography as a typical problem of the optimization search, by applying a genetic algorithm in order to minimize the mean square error between the images. They have created a database of 660 images depicting 110 people. The achieved accuracy was reported to be 99 to 100%.

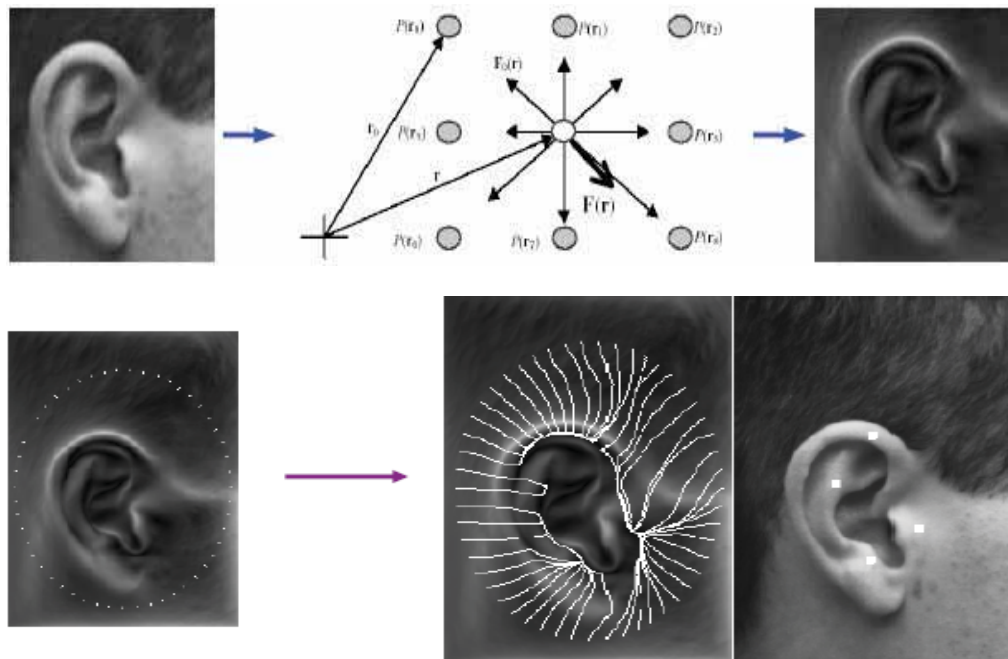
And like other biometric characteristics, research in the field of ear recognition is managed by databases that are available for algorithmic evaluation and performance analysis. Therefore, the first different databases that were developed by various research groups will be discussed in order to evaluate the potential of ear biometrics.

34 Moreno, B., Sanchez, A., Velez, J., On the use of outer ear images for personal identification in security applications. In: *Proceedings of the 33rd International Conference on Security Technology*. Madrid, Spain, 1999.

35 Mu, Z., Yuan, L., Xu, Z., Xi, D., Qi, S., Shape and structural feature based ear recognition. In: *Proceedings of the 5th Chinese Conference on Biometric Recognition (Advances in Biometric Person Authentication)*, Guangzhou, China, 2004, p. 663-670.

36 Cadavid, S., Human Identification Based on Three-Dimensional Ear and Face Models. In: *Open Access Dissertations*, paper 516, 2011.

37 Yuizono, T., Wang, Y., Satoh, K., Nakayama, S., Study on individual recognition for ear images by using genetic local search. In: *Proceedings of the 2002 Congress on Evolutionary Computation*, 2002, p. 237-242.



Picture 13. Hurley, Nixon and Carter methods

Hurley, Nixon and Carter method<sup>38, 39</sup>: in 2000 they introduce the transformation of force fields for ear identification. The image is treated as a series of Gaussian attractions, which act as a source of the force field (Picture 13). This method of obtaining characteristic is complicated but reliable and has a good tolerance to errors.

Victor, Chang, Bowyer and Sarkar method<sup>40</sup>: the method introduced in 2003, using the analysis of the main components and compare images of ear and face. Three experiments were conducted:

- 1) Experiment variations during the day,
- 2) Variations in brightness,
- 3) Variations in the position of 22.5 degrees rotation.

Although the study of earprint recognition is still in its early stage, several groups have developed methods for semi-automated or automated earprint identification. Ruttly et al.<sup>41</sup> illustrated the concept of a computerized system for identifying earprints. First, they applied the coordinate system by using two anatomical landmarks to standardize the labels localization. Labels are assigned to each print at the point where coordinate lines are crossed with anatomical structures. They did not include the effect of test data, but simplified the problem: if the used system and method may or may not pair a suspect's earprint within the earprint in the database.

Meijerman et al.<sup>42</sup> proposed the first fully automated system for earprint recognition, and tested it inside a small base of earprints taken from 6 groups of identical twins. Their method

38 Hurley, D. J., Nixon, M. S., Carter, J. N., A New Force Field Transform for Ear and Face Recognition. In: Proceedings of the IEEE 2000 International Conference on Image Processing. 2000, p. 25-28.

39 Bandyopadhyay, S., Narayan, D., Detection of an Individual after Piercing Using Ear Biometric, *International Journal of Computer Science and Mobile Computing*, vol. 2, no. 6, 2013, p. 369-375.

40 Chang, K., Bowyer, K., Sarkar, S., Victor, B., Comparison and Combination of Ear and Face Images in Appearance-Based Biometrics, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 25, no 9, 2003, p. 1160-1165.

41 Ruttly, G., Abbas, A., Crossling, D. Could earprint identification be computerised? An illustrated proof of concept paper. *International Journal of Legal Medicine*, vol. 119, 2005, p. 333-343.

42 Meijerman, L., Thean, A. Maat, G., *Earprints: Interpretation of*, Wiley Encyclopedia of Forensic Science, 2009.

consisted of the use of detection of the key points of differentiation with Gaussian operator, followed by Scale Invariant Feature Transform (SIFT)<sup>43</sup> algorithm in order to transform each detected region in the 120 dimensional characteristic vector. Then each key point was selected and compared with all others key points of the earprint candidate, in order to find a match. The best match occurred when the Euclidian's space distance of SIFT characteristics was minimal. This is followed by the geometric transformation that increases the number of matches. Finally, similarity measure is defined by the number of matching of the key points of a pair of prints.

Forensic Ear Identification Project (funded by the 6<sup>th</sup> EU Research Network)<sup>44</sup> proposes to use the estimated width, angular development and labeling of anatomy as distinctive characteristics (semi-automated system). Manually tagging of earprints and traces is done before the comparison process in order to facilitate the segmentation of images and to locate anatomical points. With a base of 7364 prints of 1229 volunteers, this approach resulted in the equal error rate (EER) of 3.9 %.

## CONCLUSION

Identification of people using their biometric characteristics in all areas of human life, including the criminal investigations is now widely present. Apart from introducing the entire anatomy of the ear, or the relevant physiological characteristics that present the identifiers that are specific to the use of ear in identification processes, the aim of this research was also exploring the possibilities of identifying a person by its biometric characteristics of the ear. The paper also shows all the parameters that may prevent reliable procedure for identifying persons through traditional earprints.

Although the current systems for the ear detection and identification reached a certain level of maturity, their success is limited to controlled indoor conditions. This suggests that ear biometrics has yet to be tested in outdoor environment. In this sense, forensics of earprints still occupies a very important place in the identification of people by their ears characteristics, and the benefits of ear biometrics recognition is yet to be identified. The global use of these types of biometrics in the coming biometric systems, such as face recognition systems, as multibiometrics is predicted.

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43 Kisku, D. R., Mehrotra, H., Gupta, P., and Sing, J. K.. SIFT-Based ear recognition by fusion of detected key-points from color similarity slice regions. In: *Proceedings of the IEEE International Conference on Advances in Computational Tools for Engineering Applications*, 2009, p. 380-385.

44 FEARID – Forensic ear identification, <http://ec.europa.eu/research/growth/warsaw/posters/pano-29-s-73.pdf>, viewed on 1 November, 2013.

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## DISCRIMINATION OF SOIL SAMPLES USING FTIR SPECTROSCOPY AND MULTIVARIATE ANALYSIS

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**Abstract.** Samples of soil can be used as a valuable tool in criminal investigations because of its transferability from different locations. The analysis of soil found on the criminals or their tools could provide clues of the origin of soil and movements of the suspects and thus be used as a proof in investigation by providing important linkage between criminals and the crime scene.

Presented research used Fourier Transformed Infrared Spectroscopy (FTIR spectroscopy) and multivariate analysis (MVA) in order to make discrimination between the soil samples collected on randomly chosen various public locations in two cities in Serbia. For each soil sample the spectral profile is like a fingerprint for that type of soil, and could be used for its identification, characterization and discrimination from other soil samples. Multivariate analysis was performed using FTIR spectra of the soil samples in the form of Principal Component Analysis (PCA) and Soft Independent modelling of Class Analogies (SIMCA).

Multivariate analysis on FTIR soil spectral data showed that it is possible to achieve good discrimination between soils found on different location based on their FTIR spectra. These results show that FTIR spectroscopy and multivariate analysis could be used as a forensic tool for determination of origin of soil samples.

**Keywords:** soil analysis, forensic science, FTIR spectroscopy, multivariate analysis, discrimination

### INTRODUCTION

Real case studies of soil appeared in the forensic literature around one century ago. George Popp in 1904 was probably the first scientist who examined soil evidences in crime scenes and used them to successfully solve criminal cases<sup>1</sup>.

The underlying premise for using trace physical evidence in forensic science is based on (1) the “locard exchange principle”, that says there will be cross-transfer of material as a result of physical contact, and (2) the examination and characterization of physical evidence to associate a suspect to the victim, the crime scene or other material evidence. Soil and sediment (when collected and analysed following a strict protocol) have the potential to provide such trace evidence in forensic investigations because its composition is largely site-specific<sup>2</sup>.

Soil is a complex material, composed of a unique combination of inorganic and organic materials such as minerals, oxides, organic matter, microorganisms, which in result give specific chemical fingerprint of the soil. The differences between soil on different locations arise from topography, climate conditions, botanical and microbiological species, climate, watering and human activities. Such complexity of the soil is from one point of view a disadvantage in forensic investigations given the fact that it requires complex analytical techniques, but on the other hand this complexity is a source of variations in soil samples and can therefore be a valuable source of information on the origin of soil samples and thus provide forensic clues.

The application of chemical and physical analysis of soil evidence in criminal cases is still largely under-utilised and can present many difficulties. Despite the diversity of pedogenetic

<sup>1</sup> Cengiz, S., Karaca, A.C., Cakir, I., Uner, H.B., Sevindik, A., SEM-EDS analysis and discrimination of forensic soil, *Forensic Science International*, 141(1), pp.33-37, 2004

<sup>2</sup> Morgan R.M., Freudiger – Bonzon J., Nichols K.H., Jellis T., Dunkerley S., Zealowski P., Bull P.A., The forensic analysis of sediments recovered from footwear, in: Ritz, K., Miller, D., Dawson, L., (Eds.), *Criminal and Environmental Soil Forensics*, Springer Science + Business Media B.V., pp.251-269, 2009

factors (parent material, climate, relief, time and organisms) and processes (addition, removal, transformation and translocation) soils can present very similar characteristics, especially when collected close to each other<sup>3</sup>. Another limitation factor is usually only small amount of soil sample available for forensic analysis which limits the possible choices of analytical methods.

The main types of soil analysis normally used for forensic issues are: particle size distribution<sup>4</sup>, soil color UV-vis spectrum<sup>5</sup>, density gradient<sup>6</sup>, microscopical features<sup>7</sup>, X-ray diffraction and Fourier Transformed Infrared Spectroscopy (FTIR)<sup>8</sup>. Presently used techniques could be summarized as those which characterize soil primarily based on their physical descriptors (color, density gradient, particle size determination, and microscopy) or chemical content (elemental composition).

Chemical analysis of the soil using spectroscopic techniques, such as FTIR (Fourier Transformed Infrared Spectroscopy) coupled with powerful analytical methods could provide rapid analysis of materials and be helpful in forensic investigations<sup>9</sup>. Furthermore, traditional limitations with regard to sample preparation for mid – IR spectroscopy are now overcome with the applications of Attenuated Total Reflectance (ATR) sampling technique. This technique allows minimal or no sample preparation and more important, for forensic investigation of soil, it requires really small quantity of sample which makes it very effective in forensic science, as stated above.

Presented research used FTIR spectroscopy with ATR as a sampling technique, and multivariate analysis in order to make discrimination between the soils samples collected on randomly chosen various locations in two Serbian cities. The spectral profile of the soil contains information on chemical content and physical properties of the soil, and if the chemical and physical properties of the soil differ from one place to another, FTIR-Attenuated Total Reflectance (ATR) spectroscopy and multivariate analysis of the collected spectra could be used for discrimination of the soil samples. The FTIR-ATR method is based on light-matter interaction and is free of chemical alterations that may occur when using KBr in conventional FTIR transmission spectroscopy. The same sample can be used over again for different analysis after it is removed from the stage. Therefore, FTIR-ATR spectroscopy provides rapid, simple, non-destructive analysis which can be used in forensics.

#### Methods and materials

Soil samples were collected from public places in two different cities in Serbia – Belgrade and Pancevo. The locations where samples of soil were collected were randomly chosen and included locations such as parking lots, gardens in front of different apartment buildings, parks, playgrounds or streets. In Belgrade, soil samples were taken from 17 different locations and in Pancevo from 5 different locations. Map locations were accurately recorded. At each site a small volume of soil (approximately 2 cm<sup>3</sup>) was collected using sterile equipment and stored in closed sterile plastic cups. All samples were dried in microwave oven for 15 min at the temperature of 100 °C in order to remove water from the samples which would otherwise give two dominant

3 Melo, V.F. Barbar, L.C., Zamora, P.G.P., Chemical, physical and mineralogical characterization of soils from the Curitiba Metropolitan Region for forensic purpose, *Forensic Science International*, 179, pp.123-134, 2008

4 Robertson, J., Thomas, C.J., Caddy, B., Lewis, A.J.M., Particle size analysis of soils - a comparison of dry and wet sieving techniques, *Forensic Science International*, 24, pp.209-217, 1984

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8 Cox, R.J., Peterson, H.L., Young J., Cusik, C., Espinoza, E.O., The forensic analysis of soil organic by FTIR, *Forensic Science International* 108(2), 107-116, 2000

spectral peaks in infrared spectra and hide interesting spectral features of soil. Presence of water in soil samples could also stimulate growth of microorganisms and bacteria during storage, which could interact with the soil and change its original properties. Drying of soil will cause living organisms to pass to resting state or die, but it will not affect mineral-phase materials which are generally resistant to modification unless excessive heat is used.<sup>10</sup>

After cooling, larger pieces of stones or vegetation were removed, and all soil samples were grinded using pestle and agate mortar to fine powder. Only amount of 1g of each soil sample was used per one acquisition of the spectra, by placing it on ATR plate. Samples were measured directly using Attenuated Total-internal Reflection (ATR) accessory (with Zn-Se crystal) and FTIR Spotlight 400 System (Perkin Elmer, Italy).

Before each acquisition of the soil spectrum, ATR plate was cleaned with acetone using lens tissues and the background infrared spectrum was collected in order to eliminate unwanted influences on spectra such as water vapour and carbon-dioxide from the atmosphere, as well as potential impurities left on the ATR crystal. The spectra were collected in the range 4000-400  $\text{cm}^{-1}$  with 4  $\text{cm}^{-1}$  resolution, and each soil spectrum was averaged across 8 scans in order to minimize noise in spectra. For each soil sample 4 spectra were acquired in random order acquisition, taking new quantity of 1g of powder, which in total resulted in 88 spectra for analyses. Acquired spectra were exported from acquisition software Spectrum 10, into Excel where each soil spectrum was assigned to a specific class corresponding to a location where soil was collected. Spectra with assigned classes were then imported in special multivariate analysis software and all analyses were then performed using Pirouette 4.0 (Infometrix Inc., USA).

## DATA ANALYSIS

Principal component analysis (PCA) is a well-known and probably the most used statistical method for reducing the dimensionality of data sets<sup>11</sup>. The goals of PCA are to a) extract most important information from the data table, b) compress the size of the data set by keeping only this important information, c) simplify the description of the data set and d) analyze the structure of the observations and the variables<sup>12</sup>. In order to extract the important information from the table, PCA represents it as a set of new orthogonal variables called principal components (PCs) and displays a pattern of similarity of the observations and of variables as points in maps (scores plot)<sup>13</sup>. Its operation can be thought of as revealing the internal structure of the data in a way which best explains the variance in the data. The new dimensions, principal components (PCs) – are built taking into account the maximum variance of data and the requirements about an orthogonal space. The number of PCs is much lower than the number of original variables, due to the linear combination of the original variables in order to form the PCs. The results of a PCA are usually presented in a form of two plots: scores plot and loadings plot, where scores relate to samples and loadings relate to variables. Scores plot allows visual insight into possible grouping of samples, and can also be used to detect and remove outliers – samples which greatly differ from other samples due to some unidentified and maybe unwanted influences, while loadings plot can reveal which variables in spectra are responsible for variance among samples.

Soft independent modelling of class analogy (SIMCA) employs Principal Component Analysis (PCA) of full spectra for the construction of mathematical models for each class to be analysed<sup>13</sup>. It is a supervised pattern recognition technique considered to be the key chemometric approach for classification.

SIMCA analysis consists of assigning training sets to classes and then a principal component model is created for each class with different confidence regions<sup>14</sup>. This technique enables

10 Shepard, S.C., Addison, J.A., Soil Sample Handling and Storage, in Soil Sampling and Methods of Analysis, 2nd ed., Carter, M.R., Gregorich, E.G. (eds.), Taylor&Francis Group, USA, 2008

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13 Svante, W., Michael, S., SIMCA: a method for analysing chemical data in terms of similarity and analogy in Chemometrics: Theory and Application, Kowalski B. (Ed.) American Chemical Society, 243-282, 1977

14 Saferstein R., Criminalistics. An Introduction to Forensic Science, 7th Edition, Prentice Hall, New Jersey, 2001

classification of samples into an already existing group, assigning new objects to the class to which they show the largest similarity. SIMCA is strongly based on PCA, because each class is defined by an independent PCA model, taking into account the optimal number of PCs for each class, which is endowed with a specific data structure. Between-class distances (or interclass distances) are calculated using between-class residuals and variable importance is determined by comparing average residual variance of each class to all classes and residual variance of all classes to themselves. Variable importance, also known as discriminative power, can be used to define variables that have a predominant effect on sample classification. A value close to 0 indicates low discrimination ability in a variable, while a value much larger than 1 implies high discrimination power<sup>15</sup>.

The identity of unknown samples can be predicted using the training models with three possible outcomes: (1) the sample fits only one pre-defined class, (2) the sample does not fit any pre-defined class, or (3) the sample fits into more than one pre-defined class<sup>16</sup>.

## RESULTS AND DISCUSSION

Figure 1 shows the raw absorbance spectra of soil samples acquired from 22 different sampling locations: 4 spectra per one sample location give in total 88 spectra. The FTIR spectra of untreated soil are dominated by the inorganic compounds present in the soil.

It can be seen from Figure 1 that spectral profiles of the soil mostly differ in the spectral region 1800-650 cm<sup>-1</sup>, and therefore other regions from the spectra were excluded from analysis. This exclusion of less important variables gives smaller data set for analysis and considerably shortens the time of the spectral processing.

Prior to analysis the spectral data were first normalized to constant total<sup>17</sup> (Figure 2). This type of spectral pre-processing provides baseline correction needed because of the variations in the baseline of the spectra which can happen due to different amounts of soil placed on ATR plate or different size of the soil particles. Normalized spectra in the selected region of interest from 1800-650cm<sup>-1</sup> are presented in Figure 2.

Before performing PCA analysis the spectra were also autoscaled, according to equation:

$$x_{ij}(\text{autoscaled}) = \frac{x_{ij} - \bar{x}_j}{s_{ij}}$$

where  $x_{ij}$  is absorbance of a particular sample  $i$  at particular wavenumber  $j$ ,  $\bar{x}_j$  is an average absorbance for all samples spectra at particular wavenumber  $j$ , and  $s_{ij}$  is a standard deviation from the average absorbance of particular spectrum  $i$  at wavenumber  $j$ .

When data has been autoscaled it is sometimes said that variables have been standardized<sup>18</sup>.

Principal component analysis was used to investigate the overall variation of data, reduce the number of dimensions present in the data matrix and for detection of outliers according to their Mahalanobis distance<sup>19</sup>. PCA modelling was developed using a cross-validation (leave four out) and it resulted in six principal components explaining more than 96.75 % of variance. However, score plots (data not shown) did not reveal any obvious separation between soil samples from different locations analysis and did not find any outliers despite the one spectrum visually distinguishable from the rest of the soil spectra (loc10, Figure 2), so it was decided that further analysis be concentrated on supervised classification – SIMCA.

SIMCA analysis was performed, beginning with assignment of different class for each soil sample location. SIMCA analysis then applies PCA to develop a pattern recognition model for

<sup>15</sup> Dunn III, W.J., Wold, S., SIMCA pattern recognition and classification, in van de Waterbeemd, H. (Ed.), Chemometric Methods in Molecular Design, VCH Publishers, New York, 65-77, 1999

<sup>16</sup> Melo, V.F. Barbar, L.C., Zamora, P.G.P., Chemical, physical and mineralogical characterization of soils from the Curitiba Metropolitan Region for forensic purpose, Forensic Science International, 179, pp.123-134, 2008

<sup>17</sup> Brereton, R.G., Chemometrics Data Analysis for the Laboratory and Chemical Plant, John Wiley & Sons Ltd, 2003

<sup>18</sup> Pirouette, Classification methods, Multivariate Data Analysis Version 4.0 User Manual, Infometrix, Inc., Woodinville, WA, 2010

<sup>19</sup> Saferstein R., Criminalistics. An Introduction to Forensic Science, 7th Edition, Prentice Hall, New Jersey, 2001

each sample class to investigate variance of each data set. Mahalanobis distance between spectra of the investigated groups should be larger than 3 if the classes are well separated<sup>20</sup>.

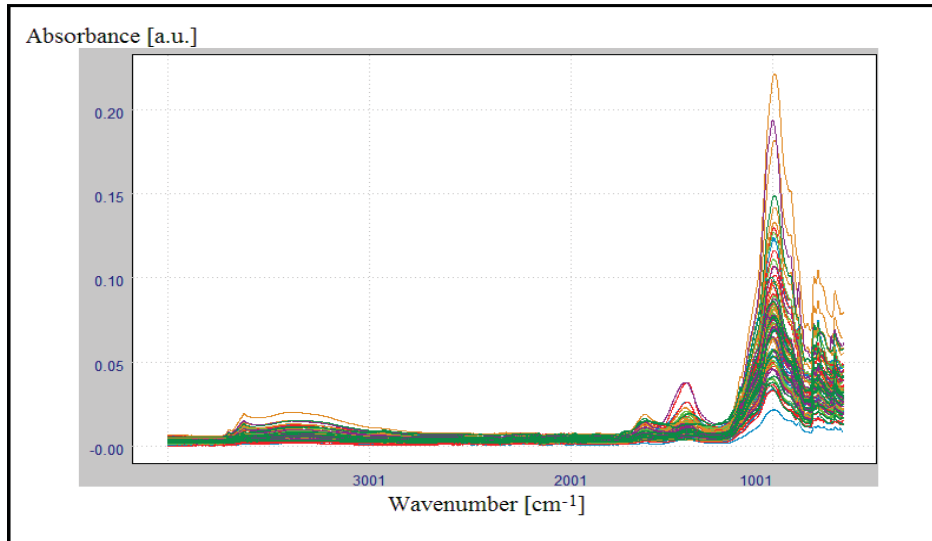


Figure 1. Raw FTIR absorbance spectra for samples taken at 22 different sampling locations

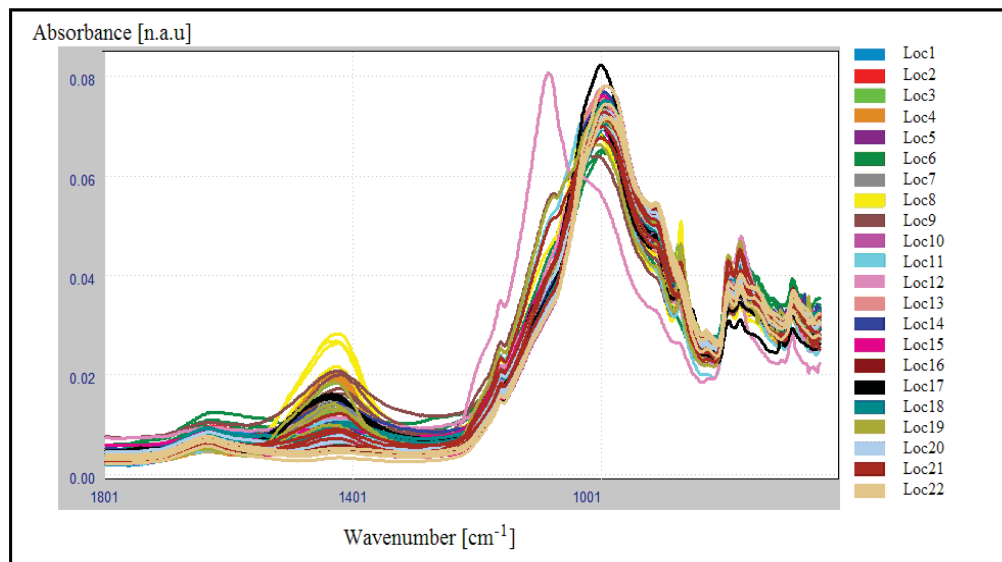


Figure 2. Normalized absorbance spectra in the region 1800-650  $cm^{-1}$

<sup>20</sup> Saferstein R., *Criminalistics. An Introduction to Forensic Science*, 7th Edition, Prentice Hall, New Jersey, 2001



The results of SIMCA analysis are presented in Table 1 and they show the separation of classes. The interclass distance (Mahalanobis distance) is well over 3 for most of the classes which means that most of the classes are well separated and that the spectra of soil from different locations can be distinguished one from another. But in 9 cases, the interclass distance has values less than 3, which means that these classes are not well separated, and that the soil from one location may be misclassified as belonging to another location.

The results of classification are presented in the form of Misclassification table (Table 2) which summarizes classification success by class. According to results from Misclassification table (Table 2), 83 out of 88 spectra of soil samples are correctly classified, which provides accuracy of classification of 94.32 %. So, even though the classes in some cases are not exceedingly well separated, the developed SIMCA model provides very high accuracy of classification.

It is noteworthy that according to SIMCA classification results, the presence of a possible outlier (loc 10, Figure 2) already mentioned did not affect significantly accuracy of classification, the results were almost the same even when this possible outlier was removed. The only consequence of including this outlier is that it was misclassified as being collected from location 15 instead of location 10 (Table 2). Analysis could not yield definite explanation why this soil sample is so different comparing to others, but it is possible that variation in the baseline has occurred due to difference in particles size in soil or because the sample was not well pressed onto ATR crystal, which after standardization lead to shift to the left in this particular spectrum.

The variables in spectra with highest discriminative power were found to be  $1090\text{ cm}^{-1}$ ,  $1093\text{ cm}^{-1}$ ,  $1187\text{ cm}^{-1}$ ,  $1190\text{ cm}^{-1}$ ,  $1400\text{ cm}^{-1}$ ,  $1475\text{ cm}^{-1}$  and  $1486\text{ cm}^{-1}$  (Figure 3).

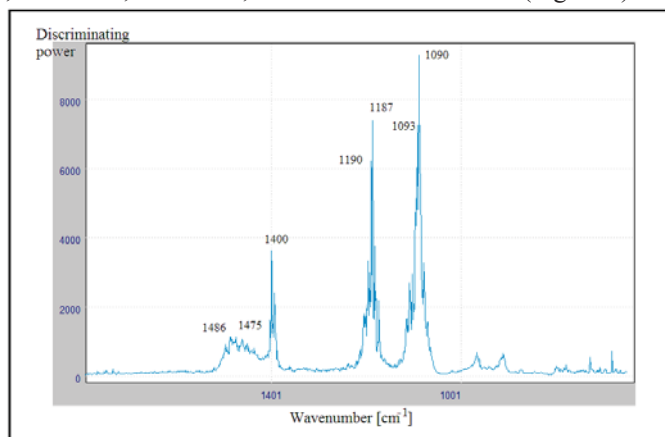


Figure 3. Discriminative power shows at which wavenumbers in FTIR spectra of soil from different locations absorbance is most different between samples. The spectral regions around  $1490\text{-}1400\text{ cm}^{-1}$  and  $1080\text{-}1200\text{ cm}^{-1}$  are displaying maximal discrimination power

Based on these identified important wavenumbers and according to assigned bands of inorganic soil compounds it is possible to draw conclusion about what inorganic compounds mainly differ between soils from different locations. The most distinctive is absorption band at around  $1090\text{ cm}^{-1}$  which could be assigned to silica gel<sup>21</sup>. The band around  $1187\text{ cm}^{-1}$  could be assigned to sodium phosphate, ammonium bisulphate or zinc chromate<sup>22</sup>. At  $1190\text{ cm}^{-1}$  could also be a weak band from silica gel<sup>23</sup>. The band around  $1400\text{ cm}^{-1}$  could be assigned to ammonium bicarbonate, while bands around  $1490\text{ cm}^{-1}$  could be from various carbonates. The quantity of these inorganic compounds in soil samples is what make these soils different and what can be reflected in their FTIR spectra and serve as a criterion for discrimination of soils according to their origin.

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	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10	Loc11	Loc12	Loc13	Loc14	Loc15	Loc16	Loc17	Loc18	Loc19	Loc20	Loc21	Loc22
Loc1	0.0	3.2	5.6	12.9	4.5	3.3	4.0	11.0	4.9	6.2	<b>2.6</b>	4.7	7.1	<b>1.7</b>	<b>2.0</b>	25.2	15.8	3.5	3.9	3.4	<b>2.5</b>	26.2
Loc2		0.0	3.4	11.9	3.5	5.5	5.3	9.5	6.3	6.9	5.6	11.5	7.1	3.2	3.6	14.9	14.5	<b>2.9</b>	5.8	<b>2.6</b>	4.8	13.3
Loc3			0.0	10.9	8.7	15.2	4.7	17.6	14.8	8.9	9.2	30.8	13.2	6.1	9.3	21.7	14.0	8.3	10.7	7.5	8.9	18.7
Loc4				0.0	22.8	24.9	10.5	11.4	12.7	15.8	13.9	26.4	24.9	8.9	20.0	39.6	13.6	22.3	8.7	17.2	16.5	36.4
Loc5					0.0	7.3	10.1	28.6	15.1	5.5	8.6	23.5	7.0	4.3	5.2	11.5	33.9	7.1	12.1	<b>2.1</b>	10.0	13.0
Loc6						0.0	9.9	20.2	10.1	16.0	9.0	8.5	20.2	4.4	4.7	43.6	22.0	8.6	10.3	4.9	5.4	38.6
Loc7							0.0	13.9	8.0	6.7	5.1	17.1	11.3	3.0	7.0	27.6	11.2	9.4	5.7	7.4	5.4	30.0
Loc8								0.0	7.0	19.9	18.4	23.4	35.9	9.6	28.9	66.4	41.0	31.8	10.4	22.4	15.6	69.1
Loc9									0.0	16.1	10.3	7.3	18.7	4.6	10.5	60.1	16.7	15.8	7.0	11.8	7.4	62.1
Loc10										0.0	9.0	19.3	6.9	5.0	5.2	9.1	27.2	11.2	9.1	3.3	7.1	6.4
Loc11											0.0	8.8	12.5	4.3	5.1	35.6	17.0	5.9	4.2	5.0	3.2	44.3
Loc12												0.0	31.5	9.3	10.3	105.8	30.1	20.4	6.3	6.6	6.5	155.0
Loc13													0.0	5.4	11.7	16.2	39.9	13.8	14.9	6.1	17.0	25.0
Loc14														0.0	<b>2.3</b>	18.1	13.9	3.9	4.3	4.5	3.5	15.5
Loc15															0.0	26.3	28.6	8.2	6.9	<b>2.4</b>	4.8	31.0
Loc16																0.0	43.2	23.4	42.4	9.3	39.7	10.3
Loc17																	0.0	23.2	12.4	21.2	25.7	50.2
Loc18																		0.0	9.2	3.4	5.3	27.9
Loc19																			0.0	8.0	3.6	50.3
Loc20																				0.0	3.6	9.4
Loc21																					0.0	54.2
Loc22																						0.0

Table 1. Interclass (Mahalanobis) distance for 22 classes of soil samples (different class means different origin of soil sample).

Actual class of soil samples (actual location)		Predicted class of soil samples (predicted location)																						
		Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10	Loc11	Loc12	Loc13	Loc14	Loc15	Loc16	Loc17	Loc18	Loc19	Loc20	Loc21	Loc22	
Loc1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loc2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loc3	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loc4	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loc5	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loc6	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loc7	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loc8	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loc9	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loc10	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loc11	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Loc12	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Loc13	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
Loc14	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Loc15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Loc16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
Loc17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Loc18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
Loc19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
Loc20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Loc21	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0
Loc22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4

Table 2. Results of classification of soil samples FTIR spectra using SIMCA analysis.

## CONCLUSION

The aim of this research was to explore the potential of FTIR spectroscopy and multivariate analysis in classification of soil samples from different locations based on their FTIR spectra. Analysis of the spectra of soil collected from different locations shows that such classification is possible using SIMCA, as a supervised classification technique, on data set consisted of 88 samples spectra (22 different sampling locations). The achieved accuracy of classification was 94.32 %.

It is important to note that there are potential limitations in using soil and determination of the place of soils origin. During transfer of soil from crime scene, especially in the case of footwear, it is possible that mixing of the soil from different sources could occur through time. It is important that this aspect of the contamination of soil as evidence should be clarified when presenting and interpreting the results of analysis<sup>24</sup>.

However, the results presented in this paper show that FTIR spectroscopy and multivariate analysis could be a good forensic tool for determination of the origin of soil samples. The results were obtained using relatively small dataset (88 spectra of soil, based on 22 different locations), so in our future work, we plan to increase the number of different locations and sample sites within one location in order to fully establish potential and/or limitations of presented discrimination analysis based on FTIR spectroscopy and multivariate analysis.

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## **THE ROLE OF ANTHROPOLOGISTS IN FORENSIC INVESTIGATIONS OF EXHUMATED DEAD BODIES**

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**Abstract:** Forensic anthropology has an important role in the research process and of great importance is the presence of anthropologists during the exhumation of the bodies and the subsequent forensic expertise. Anthropologist on the evidence available to him finds gender age race, physique, physique activity that a person so engaged. The assessment of partially or completely decomposed post mortal remains in cooperation with forensic medical examiners, forensic anthropologist make post mortem analysis remains, to be done biological profile of a deceased person.

**Keywords:** Anthropology, Forensic investigation, forensic science, forensic pathologists.

### **INTRODUCTION**

Anthropology is the interdisciplinary science of man so that scientific knowledge comes to bringing mediated facts from different disciplines according to their own theory methodology.

Anthropologists together with experts in the field of osteology, which is under the discipline of anthropology, applied their knowledge in the analysis and interpretation of bone lesions. Knowledge in osteology used for forming the identification of the biological profile and bone residues. Understanding bone morphology an application of this knowledge in forensic anthropology serve to clarify the circumstances of the death. Forensic anthropologists apply standard scientific techniques developed in physical anthropology to identify human remains and assist in uncovering crimes, they collaborate with forensic pathologists and homicide investigators to identify the victim, discovered evidence and the time of death. In addition to locating and creating the overall picture related to certain unidentified skeletal remains of forensic anthropologists suggest age, race, height, and other individual characteristics on the bones of the skeleton. Forensic anthropology is the branch of the biological ( physical) anthropology that deals with the analysis of skeletal remains and their identification in the legal or medical science of law. Forensic anthropology has an important role in the research process and great importance is the presence of anthropologists during the exhumation of corpses and the subsequent forensic expertise. Scientists a round the world based on experiences during the exhumation to emphasize, in our study the role anthropologists gained an important place.

The mere identification, and determination of a person identity is a process which includes various types of analysis depending on what remains of the word.

Identification methods ranging from subjective recognitions of persons by their families, the objective results in case of identification of fresh corpses. However, often the cases where the identification carried out on the bodies of the victims changed. It was then in the process of identification include anthropological methods.

### **INTERDISCIPLINARY COOPERATION FORENSIC ANTHROPOLOGISTS AND FORENSIC PATHOLOGISTS**

Exhumation and autopsy of the expects can get all of those answers are obtained, and the finely and complete autopsy. Forensic investigations graves and mass disasters is usually performed with multidisciplinary teams. The task of forensic scientists in the study of mass disas-



ters and mass graves likely include identification of victims, determining the pattern and manner of death and the collection of findings that may help in finding a sample of the incident and the series of events that followed the conflict.<sup>1</sup>



*Images No.1 Identification of grave*

Depending on the type of decomposition, sometimes after a long stay bodies in the country, can clearly see injuries to the soft tissues. Sometimes it is important and the absence of hard tissue injuries, suspected and assumed to exist. In the case of other evidence that specifically traces at the scene, the circumstances of the case is the autopsy exhumed, corpse may be higher or lower probability to indicate the origin of death, cause of death, injury mechanism, and more.<sup>2</sup>

Putrefied corpses significantly hamper forensic expertise and require special psychological and physical preparedness experts who conducted the autopsy, and support staff in charge of the case and preparing the work of the bodies. Depending on whether the forensic exhumation and subsequent autopsy performed at the stage of investigation or criminal proceedings this type of forensic expert determined and managed by the investigating judge.



*Images No.2 Forensic exhumations and autopsies on the spot*

<sup>1</sup> Bass W.M, Birkly W. H:Exhumation:The methods could make the difference. FBI.Law Enforcement Jul 6 – 11.1978

<sup>2</sup> Bekic H, Strinic D, Slaus H, Skoric J, Zecevic D, Milicevic M, Dentol identification war victims from Petrinja in Croatia into legal Med; 110 51, 1997.

The forensic autopsy is required in cases:

When previously done at all autopsies, in some cases it is exhumation victims buried in the ground outside the cemetery by the killers in order to collect a specific crime problem consists exhumation of bodies from mass graves that require the involvement of other professionals such as forensic anthropologists, forensic archeologists, forensic odontologists forensic entomologists and other.

In suspected wrong identification forests.

In order to take materials for specific analysis – DNA, toxicological review.

The objectives of forensic exhumations are to determine the origin and cause of death, in order to determine the identity of forests, in order to take the material for DNA analysis and to determine the mechanism of injury. The process of exhumation beginning archeologists removal of topsoil latest techniques and defining holes and body position. The remains found on the site is mapped, after which the computer simulation of the real tomb. Exhumation is done by first identifying the burial place of the deceased, then access the exhumation of extracting the crates out of country if it is buried. Exhumation and autopsy carried out on the principle of discharge of a forensic autopsy. An autopsy is usually performed with a burial place for if it can not provide adequate conditions. If there is suspicion of trauma, and the authorities can still identify the toxicological examination should take organs and steam in both organs ( two kidneys) if the authorities do not recognize taken their remains. Be sure to be taken and samples of materials from the surrounding forest, in order to exclude possible posthumous undiluted poison in the body. Before the start and during the exhumation should be photographed in detail any significant findings and eventually be disposed sanitary burial place.<sup>3</sup>



*Images No. 3 Removal of organs for Toxicological review*

Usability findings depend on the degree of preservation of forests, which is determined by the time that is spent in the forest land, and the local conditions in which the corpse is located. Finding the soft tissues is only usable in a short period of time while finding the bones and tissues of the most significant because of the resistance of bone tissue.

Now perform a forensic anthropologists who can help in processing of the crime scene. Anthropologist can validly take osteological material from a given place and analyze the remains of whether they dismembered or in full.

Anthropologist can assist in the reconstruction of the events leading up to the death of a particular person and notice any changes to the bones themselves, ie. skeleton and in the vicinity of the crime scene.<sup>4</sup> After finding the bones anthropologist can determine many biological characteristics that are needed to identify the deceased and finally, he can find all the relevant clues in the bones and teeth which can be related to the cause of death.

<sup>3</sup> Brookss – Suchey Skeletal age determination based on the os pubis: a amparison of the Aesadi – Nemesker and SucheyBroks methods, Human Evolution 5, 227 – 238, 1990.

<sup>4</sup> Bekic H, Strinic D, Slaus M, Skoric J, Zecevic D, Milicevic M, Dentol identification war wictims from Petrinja in Croatia into legal Med; 110: 81 – 83, 1997.



*Images No.4 Finding relevant marks of the bones*

The presence of forensic anthropologist would be necessary in the case when it comes to complete the rest of loess when les falling apart when there is a skeleton only ( no loess tissue), when the skeletal remains in an altered state. The main task of forensic anthropologists, no matter which of these stages are skeletal remains, is to identify them. Confirming the basic biological characteristics such as sex, race ethnicity, height, the first of the data that can be obtained at forensic substructure.

Inspecting further, we can get some individual biological characteristics such as non – life injuries and broken bones, wearing certain prostheses and aids for life, then information such as changes in bone that occur due to certain health problems and diseases, can significantly focus more in – depth investigation of a certain gender, age, racial groups. Seeing the small structural changes in the skeleton and determining sample their creation make a key contribution to the anthropologist forensic investigation.

Bearing in mind the presented cases, the forensic anthropologist can contribute to the investigation and of the identification, the only remains unclear what kind of information can offer forensic anthropology when it comes to complete the rest of the loess if the soft tissue intact their analysis can reveal various information that can contribute to the cause of death and the events directly related to them. Most often, the complete loess remnants review forensic medicine or pathology as these cases for them routinely and presence forensic anthropologist is not necessary. However, there are certain situations in which a forensic anthropologist can help determine certain characteristics of the investigated forest although the skeleton quite soft tissues. If you can the complete loess remains in the sense that it lacks limbs or head, a forensic anthropologist can provide information on the amount of the individual, precisely determine the age, but also help in determining the tool, an instrument which is mutilation performed, and certain angles of cutting.<sup>5</sup>

During the research partially or completely skeleton remains investigators are facing many unknowns. To conduct a complete forensic investigation is needed to answer the ten key issues. In most cases, the only way to get accurate answers to these questions to engage forensic anthropologist who can help and direct the investigation in the right direction, very often lead to the identification of which is the main objective.

Almost anyone can recognize the bones as well as parts of complete skeletons, most can recognize an undamaged bone, but it is difficult to identify the parts of the bones. Only a person who has a lot of experience in the identification of bone can determine whether they are bone and that bone is it?

Recognition of the skeleton in the normal anatomic configuration for investigators is not a problem. However, the scattered bones of a bigger problem. Bones such as the femur or tibia, then the vertebrae, ribs, bones of the hands and feet are the problem. Some of the bones in hu-

<sup>5</sup> Brooks Suchey M. Skeletal age determination based on the os pubis: a amparis of the Aesad – Nemesker and Suchey Broks methods, Human Evolution 5, 246 – 253,1990.

mans and in animals have similar characteristics and some experience is required to distinguish. The skeletal remains of the muscle which has further aggravated things.

The bones of small children can confuse anyone often, the bones of young children have been identified as the bones of animals or birds. If a person does not have experience in the identification of the bones, their determination is complicated. Experienced forensic anthropologists not a problem.

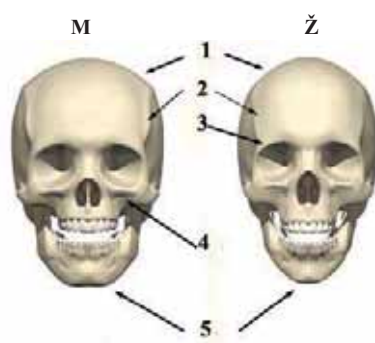
One feature that is used to determine the age of the residues curvature of the femur. Condition remains the characteristic which separates the ancient from the modern population. It is believed that the bones which have a strong odor, and those that are fatty that with organic substances belonging to the contemporary population, and those that are physically damaged area, probably as old. And changes in teeth are important, excessive wear of the teeth, and jaw damage are characteristic of ancient remains. Fillings indicate the time was approaching, but still provide a large time span. West odontology can determine the age of the reconstruction based on the style of performance, so that the trace can help you determine how much time has passed since the death.

The completeness of the skeleton (if there is any)? Each bone is a possible clue. It is necessary to make a list of bones as part of the case file, and so be sure to have all the bones. Identification of the bones must be done expert whether it is the doctor or anthropology<sup>6</sup>

Is it the skeleton of one or more persons? If found bones that come from multiple individual a forensic anthropologists most determine which bones belong to and how many individuals are present.

Race, nationality, membership of a culture. From the perspective of forensic experts, using a model of tree races, has some value to describe the genetic and morphological characteristics. Forensic scientists must use terms that are defined in the model in order to identify the corpse. The model is not perfect, but it helps in understanding the differences in the shape and form of some parts of the skeleton, particularly the skull. For forensic anthropologist determine the race using the skull, so the identification of different types and relative amounts of some of the bones that from the different facial features and contribute to the overall appearance and size of the skull.

Several elements of the skeleton should be a forensic anthropologist to be able to determine the sex of an adult, a pelvic bone is the most reliable for this type of identifications. Female pelvis is much wider and shorter than the male. The second most important part of the skeleton in determining half the skull. Women's skulls are more fragile. Males have a broader square chin. Unfortunately, pelvis and skull are not always available forensics. In this case, forensics anthropologist use as many techniques to estimate safer.



*Images No. 5 Difference between the skull*

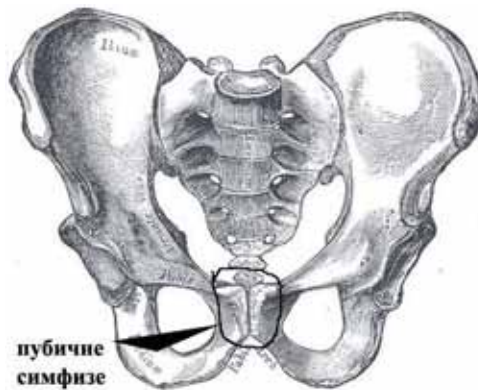
<sup>6</sup> Brooks, Suchey M, Skeletal age determination based on the os pubis: a comparison of the Aesadi – Nemesker SucheyBrooks methods, Human Evolution 5, 257, 1990.



*Images No 6 Difference between the male and female pelvis*

Age in determining skeletal age forensic anthropologist will always talk about the hand. One of the key differences between the skeletons of children and adults is the existence of the pineal gland. Epiphysis growth centers are appearing in all the bones, and the most important in the long bones. In order to determine as precisely as possible the individual age we need to examine teeth, skull, vertebrae, pelvis, long bones and then based on all indicators make possible the assessment of age. Age determination based on the pubic symphysis is using Suchey – Broks and Tood model. Features used in the study of age varies in different developmental stages (children, youth, adults). It is much more exact determination of the age of the fetus and neonate in a preserved forest than the skeleton percent of the immature fetal bone very easily fall apart in comparison to the strong bones of adults.<sup>7</sup>

After about twenty five year until old age does not appear significant changes such as tooth eruption and emergence ossification centers. The main indicators of age in this period are changes in the pubic symphysis, ribs and cranial sutures. For the investigated groin symphysis reliable morphological characteristics within Suchi – Brooks categories are set symphyseal surface expression of ridges and furrows, ventral beveled, separation over the surface symphysis.



*Images No 7 Indication of age – changes in the pubic symphysis*

Experienced forensic anthropologist can be found in the examination of the long bones to estimate the age of the individual. This estimate is obtained by measuring the long bones and comparison tables of regression formula derived from many measurements of skeletal remains.

After reforming the previous to the question of gender race, age, height, investigated the subject, we settled into a certain group but did not answer the question of who is this person? Experienced forensic anthropologist's is a change on the teeth the skeletal remains, pathological

<sup>7</sup> Skinner M, Alempijevic Dj, Djuric – Srejac, M. Guideline for international Forensic bio archeology Monitors of Mass Grave Exhumation SCI. int.



changes in bone provide information with which to execute positive identification i.e. Authentication. Bearing in mind that the forensic anthropologist usually included in the research team, when it comes to the found skeletal remains, the absence of soft tissue, it is impossible to draw a positive identification based on fingerprints, resorted to the following steps: the family of the deceased asks the medical and dental records lifetime medical and x-rays. These x-rays are compared with data obtained post mortem investigation and search out any similar that may confirm the identity of the test skeleton. Each person's lifetime bone fracture injury, implant remains recorded in the medical record, yet remain prominent and bone. Certain diseases leave marks on the bones, and it can give us a hint, tuberculosis, rickets, scurvy and other diseases have permanent bone deformities that vary with each individual. Most of the people who had contact with some of these diseases have x-rays in their medical records and to us a lot easier identification.

### CONCLUSION

Experiences so far have confirmed the importance of the exhumation of forensic expertise, as exhumation is the first and basic stage to collect the remains and objects related to the identification, but also the circumstances in which the person died.

During the evolution part completely decomposed or skeletal remains, forensic anthropologist make post mortem analysis in order to make the biological profile of the deceased. Anthropologist on the evidence available to him finds gender age, height, color material, physical activities that people engaged.

Studies have shown that anthropological estimated height and half carcasses highly statistically significant and successful and thus obtained significant elements for preliminary identification. The role of the anthropologist in forensic teams, in terms of mass death and the exhumation of mass graves is very important. Anthropological research provides faster and more accurate performance of the identification process which is invaluable in clarifying complex responsible forensic identification procedures, especially when it comes to skeletal corpses and parts of corpses.

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## CLLOUD COMPUTING SECURITY SERVICE MODEL

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**Abstract** : Cloud computing is one of today's most exciting technologies due to its ability to reduce costs associated with computing while increasing flexibility and scalability for computer processes. During the past few years, cloud computing has grown from being a promising business idea to one of the fastest growing parts of the IT industry. IT organizations have expressed concern about critical issues (such as security) that exist with the widespread implementation of cloud computing. These types of concerns originate from the fact that data is stored remotely from the customer's location; in fact, it can be stored at any location.

Cloud computing has generated a lot of interest and competition in the industry and it is recognized as one of the top 10 technologies of 2013. It is an internet based service delivery model which provides internet based services, computing and storage for users in all markets including financial, health care & government. Cloud security is becoming a key differentiator and competitive edge between cloud providers. From the providers' point of view a Cloud is a very large distributed system which poses many challenges. Cloud computing is clearly one of today's most enticing technology areas to its cost-efficiency and flexibility. There is a growing trend of using cloud services for ever growing storage and data processing needs.

**Keywords:** Information technology, Security techniques, Cloud computing, Privacy, Requirements.

### INTRODUCTION

Cloud Computing is not a total new concept; it is originated from the earlier large-scale distributed computing technology. However, it will be a subversion technology and cloud computing will be the third revolution in the IT industry, which represent the development trend of the IT industry from hardware to software, software to services, distributed services to centralized service. The core concept of cloud computing is reducing the processing burden on the users' terminal by constantly improving the handling ability of the cloud, eventually simplify the users' terminal to a simple input and output devices and busk in the powerful computing capacity of the cloud on-demand. All of this is available through a simple internet connection using a standard browser or other connection.

Cloud computing is a model for enabling convenient and on demand network access to a shared group of computing resources that can be rapidly released with minimal management effort or service provider interaction. Cloud has advantages in offering more scalable, fault-tolerant services with even higher performance. Also, Cloud computing can be referred to as a new kind of storage technology, by which we can share software, data or documents to computers as well as other devices on demand.

Cloud Service providers (CSP) (e.g. Microsoft, Google, Amazon, Salesforce.com, GoGrid) are leveraging virtualization technologies combined with self-service capabilities for computing resources via the Internet. In these service provider environments, virtual machines from multiple organizations have to be co-located on the same physical server in order to maximize the efficiencies of virtualization. Cloud service providers must learn from the managed service provider (MSP) model and ensure that their customers' applications and data are secure if they hope to retain their customer base and competitiveness. Today, enterprises are looking toward cloud computing horizons to expand their on-premises infrastructure, but most cannot afford the risk of compromising the security of their applications and data.

Corporations and individuals are concerned about how security and compliance integrity can be maintained in this new environment. Even more concerning, though, is the corpora-

tions that are jumping to the cloud computing while being oblivious to the applications of putting critical applications and data in the cloud. Moving critical applications and sensitive data to a public and shared cloud environment is a major concern for corporations that are moving beyond their data centers' network perimeter defense. To alleviate these concerns, a cloud solution provider must ensure that customers can continue to have the same security and privacy controls over their applications and services, provide evidence to these customers that their organization and customers are secure and they can meet their Service level agreements and show how can they prove compliance to their auditors.

Cloud computing is one of today's most exciting technologies due to its ability to reduce costs associated with computing while increasing flexibility and scalability for computer processes. During the past few years, cloud computing has grown from being a promising business idea to one of the fastest growing parts of the IT industry. IT organizations have expressed concern about critical issues (such as security) that exist with the widespread implementation of cloud computing. These types of concerns originate from the fact that data is stored remotely from the customer's location; in fact, it can be stored at any location.

Cloud computing is the next stage of the Internet evolution. A typical cloud must have several distinct properties: elasticity and scalability, multi-tenancy, self-managed function capabilities, service billing and metering functions, connectivity interfaces and technologies. In addition, a cloud supports large scale user accesses at distributed locations over the Internet, offers on-demand application services at anytime, and provides both virtual and/or physical appliances for customers. There are three types of clouds: a) private clouds, which are internal clouds based on a private network behind a firewall; b) public clouds, which are the clouds with public accessible services over the Internet; and c) hybrid clouds, which are made of different types of clouds, including public and private clouds<sup>1</sup>. (Figure 1)

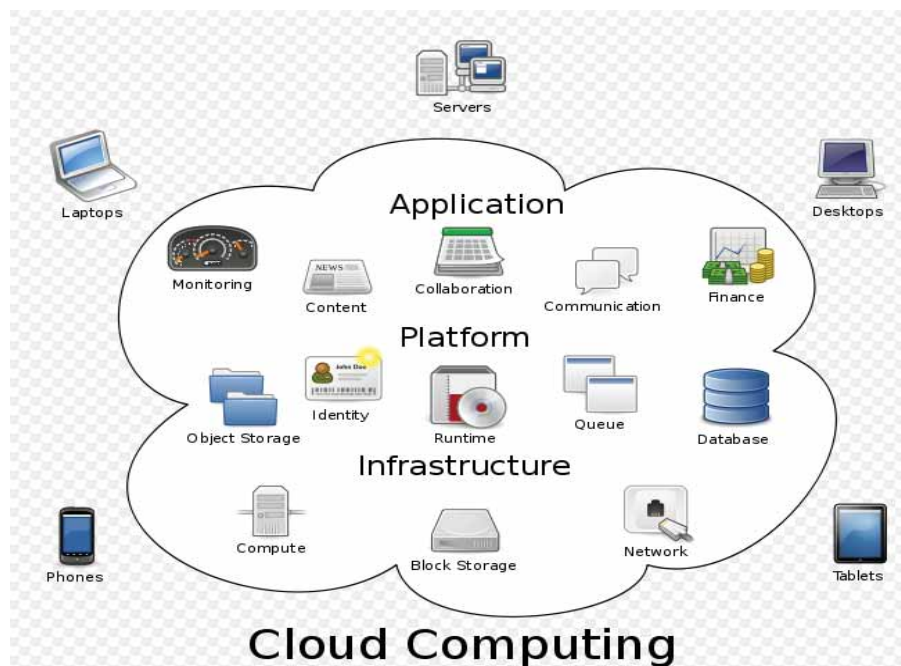


Figure1 - Cloud architecture

<sup>1</sup> Rich Maggiani, solari communication, "Cloud computing is changing how we communicate".

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## NEED OF CLOUD COMPUTING

Cloud computing enables users to store and process all their data on the web via the Internet, with no doubts security is one of the main significant concerns. A more fundamental reason preventing companies from moving to cloud computing is that the cloud computing platform is inherently less secure than the traditional network infrastructure. Security must be integrated into every aspect of cloud computing platforms to make users trust that their data is secure.

Security, in particular, is one of the most argued-about issues in the cloud computing field; several enterprises look at cloud computing warily due to projected security risks. The risks of compromised security and privacy may be lower overall, however, with cloud computing than they would be if the data were to be stored on individual machines instead of in a so-called "cloud" (the network of computers used for remote storage and maintenance). Comparison of the benefits and risks of cloud computing with those of the status quo are necessary for a full evaluation of the viability of cloud computing. Consequently, some issues arise that clients need to consider as they contemplate moving to cloud computing for their businesses.

## CLOUD DEPLOYMENTS MODELS

In the cloud deployment model, networking, platform, storage, and software infrastructure are provided as services that scale up or down depending on the demand. These fundamental elements of the cloud require security which depends and varies with respect to:

- the deployment model that is used
- the way by which it is delivered

The Cloud Computing model (Figure 2) has three main deployment models which are:

1. Private cloud
2. Public cloud
3. Hybrid cloud
4. Community cloud

### Private cloud

Private cloud is a new term that some vendors have recently used to describe offerings that emulate cloud computing on private networks. It is set up within an organization's internal enterprise data centre. In the private cloud, scalable resources and virtual applications provided by the cloud vendor are pooled together and available for cloud users to share and use. It differs from the public cloud in that all the cloud resources and applications are managed by the organization itself, similar to Intranet functionality. Utilization on the private cloud can be much more secure than that of the public cloud because of its specified internal exposure. Only the organization and designated stakeholders may have access to operate on a specific Private cloud.

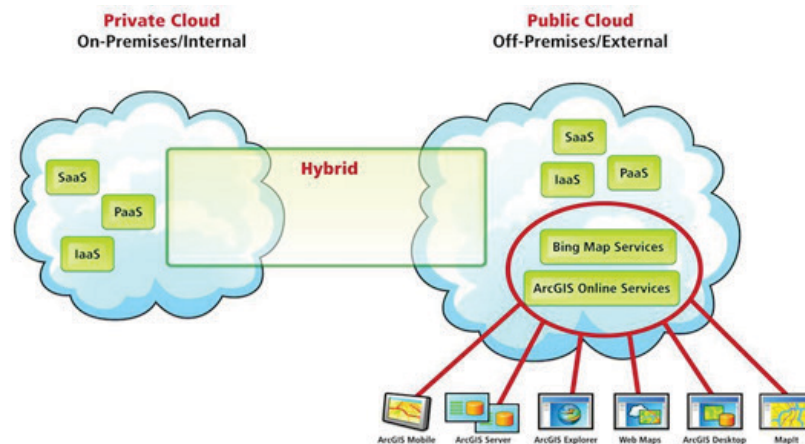


Figure 2 - Cloud deployment models

### Public cloud

Public cloud describes cloud computing in the traditional mainstream sense, whereby resources are dynamically provisioned on a fine-grained, self-service basis over the Internet, via web applications/web services, from an off-site third-party provider who shares resources and bills on a fine-grained utility computing basis. It is typically based on a pay-per-use model, similar to a prepaid electricity metering system which is flexible enough to cater for spikes in demand for cloud optimization. Public clouds are less secure than the other cloud models because it places an additional burden of ensuring all applications and data accessed on the public cloud are not subjected to malicious attacks.

### Hybrid cloud

Hybrid cloud is a private cloud linked to one or more external cloud services, centrally managed, provisioned as a single unit, and circumscribed by a secure network. It provides virtual IT solutions through a mix of both public and private clouds. Hybrid Cloud provides more secure control of the data and applications and allows various parties to access information over the Internet. It also has an open architecture that allows interfaces with other management systems. Hybrid cloud can describe configuration combining a local device, such as a Plug computer with cloud services. It can also describe configurations combining virtual and physical, collocated assets -for example, a mostly virtualized environment that requires physical servers, routers, or other hardware such as a network appliance acting as a firewall or spam filter.

### Community cloud

The cloud infrastructure is shared among a number of organizations with similar interests and requirements. This may help limit the capital expenditure costs for its establishment as the costs are shared among the organizations. The operation may be in-house or with a third party on the premises.

## CLOUD COMPUTING SERVICE DELIVERY MODELS

Following on the cloud deployment models, the next security consideration relates to the various cloud computing service delivery models (Figure 3). The three main cloud service delivery models are:

- Infrastructure As A Service (IAAS)
- Platform As A Service (PAAS)
- Software As A Service (SAAS)

Combining the three types of clouds with the delivery models we get a holistic cloud illustration as seen in Figure, surrounded by connectivity devices coupled with information security themes. Virtualized physical resources, virtualized infrastructure, as well as virtualized middle-ware platforms and business applications are being provided and consumed as services in the Cloud. Cloud vendors and clients“ need to maintain Cloudcomputing security at all interfaces.

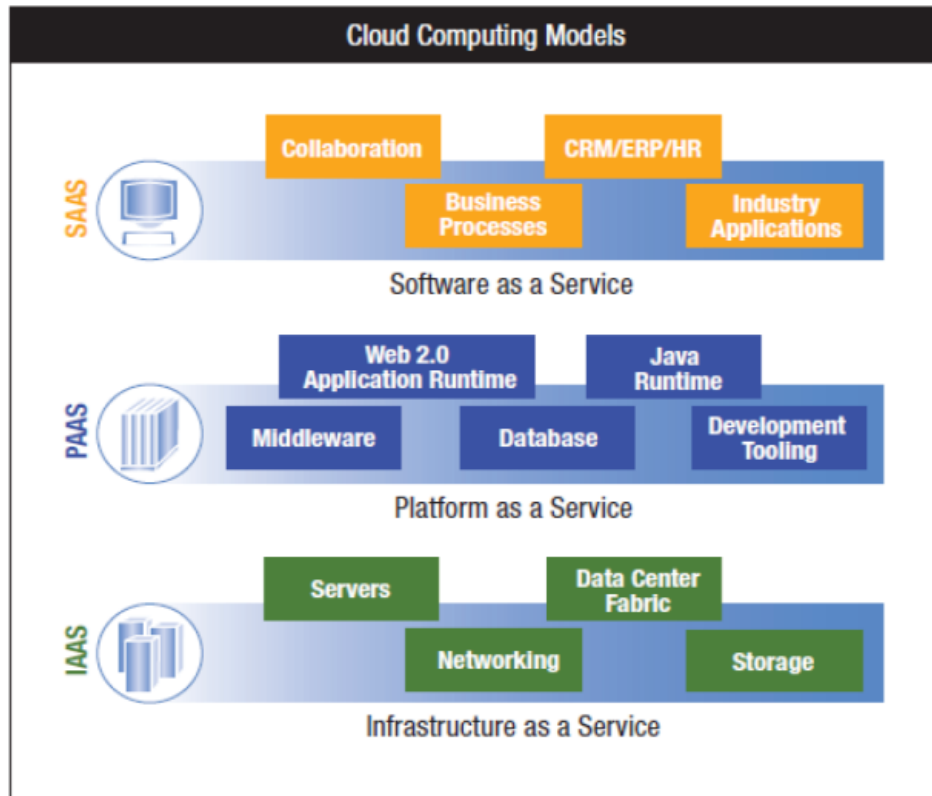


Figure 3 -Cloudcomputingservicedeliverymodels

#### Cloud Infrastructure as a Service (IaaS)

A model in which an organization outsources the equipment used to support operations including storage, hardware, virtual servers, databases, and networking components. The service provider owns the equipment and is responsible for housing, running, and maintaining it<sup>2</sup>.

**Characteristics of IaaS** - As with the two previous sections, SaaS and PaaS, IaaS is a rapidly developing field. That said there are some core characteristics which describe what IaaS is. IaaS is generally accepted to comply with the following:

- Resources are distributed as a service
- Allows for dynamic scaling
- Has a variable cost, utility pricing model
- Generally includes multiple users on a single piece of hardware<sup>3</sup>

<sup>2</sup> Kevin Curran, Sean Carlin and Mervyn Adams "Security issues in Cloud Computing",

<sup>3</sup> Kevin Hemalen, Murat Kantarcioglu, Latifur Khan and Bhavani Thuraisingham, The University of Texas at Dallas, USA, "Security Issues for cloud computing"



### Cloud Software as a Service (SaaS)

The capability offered to the consumer is to use the provider's commercially available applications running on a cloud infrastructure. The applications are accessible from various client devices through a thin client interface such as a Web browser. One of the most common uses for SaaS is for Web-based email services. SaaS enables enterprises to obtain the use of such commercially available software on demand without the need to invest in IT resources knowledgeable in its support.

**Characteristics of SaaS** - Like other forms of Cloud Computing, it is important to ensure that solutions sold as SaaS in fact comply with generally accepted definitions of Cloud Computing. Some defining characteristics of SaaS include:

- Web access to commercial software.
- Software is managed from a central location.
- Software delivered in a one-to-many model.

### Cloud Platform as a Service (PaaS)

The two components of PaaS are the place on which software can be launched (platform), and the services being provided (solution stack). Resources being delivered via PaaS typically include infrastructure and applications. In many cases the data being used is also stored in the cloud and the end user's terminal may contain only an operating system and Web browser. In addition, end users can write their own code and the PaaS provider then uploads that code and presents it on the Web. Sales-Force.com's Force.com is an example. The PaaS model enables resources to be increased easily with demand since end users share the same cloud. This is often called multi-tenant cloud computing.

**Characteristics of PaaS** - There are a number of different takes on what constitutes PaaS but some basic characteristics include,

- Services to develop, test, deploy, host and maintain applications in the same integrated development environment. All the varying services needed to fulfill the application development process.
- Multi-tenant architecture where multiple concurrent users utilize the same development application.
- Built in scalability of deployed software including load balancing and failover.

## SECURITY ISSUES IN CLOUD COMPUTING

Cloud Computing is a model for information and services by using existing technologies. It uses the internet infrastructure to allow communication between client side and server side services/applications. Cloud Service Providers (CSP's) exist between clients that offer cloud platforms for their customers to use and create their own web services. When making decisions to adopt cloud services, privacy or security has always been a major issue. To deal with these issues, the cloud provider must build up sufficient controls to provide such level of security than the organization would have if the cloud were not used. The major security challenge is that the owner of the data has no control on their data processing. Due to involvement of many technologies including networks, databases, operating systems, resource scheduling, transaction management, concurrency control and memory management, various security issues arise in cloud computing.

**Security** - Where is your data more secure, on your local hard drive or on high security servers in the cloud? Some argue that customer data is more secure when managed internally, while others argue that cloud providers have a strong incentive to maintain trust and as such employ a higher level of security. However, in the cloud, your data will be distributed over these individual computers regardless of where your base repository of data is ultimately stored. Industrious hackers can invade virtually any server, and there are the statistics that show that one-third of

breaches result from stolen or lost laptops and other devices and from employees' accidentally exposing data on the internet, with nearly 16 percent due to inside theft<sup>4</sup>.

**Privacy** - Different from the traditional computing model, cloud computing utilizes the virtual computing technology, users' personal data may be scattered in various virtual data center rather than stay in the same physical location, even across the national borders, at this time, data privacy protection will face the controversy of different legal systems. On the other hand, users may leak hidden information when they accessing cloud computing services. Attackers can analyze the critical task depending on the computing task submitted by the users<sup>5</sup>.

**Reliability** - Servers in the cloud have the same problem as your own resident servers. The cloud servers also experience downtimes and slowdowns, what the difference is that users have a higher dependent on cloud service provider (CSP) in the model of cloud computing. There is a big difference in the CSP's service model, once you select a particular CSP, you may be locked-in, thus bring a potential business secure risk.

**Open Standard** - Open Standard are critical to the growth of cloud computing. Most cloud providers expose APIs which are typically well-documented but also unique to their implementation and thus not interoperable. Some vendors have adopted others APIs<sup>6</sup> and there are a number of open standards under development, including the Open Cloud Computing Interface. The Open Cloud Consortium (OCC)<sup>7</sup> is working to develop consensus on early cloud computing standards and practices.

**Compliance** - Numerous regulations pertain to the storage and use of data require regular reporting and audit trails, cloud providers must enable their customers to comply appropriately with these regulations. Managing compliance and security for cloud computing, provides insight on how a top-down view of all IT resources within a cloud-based location can deliver a stronger management and enforcement of compliance policies. In addition to the requirements to which customers are subject, the data centers maintained by cloud providers may also be subject to compliance requirements.

#### Long-term Viability

You should be sure that the data you put into the cloud will never become invalid even your cloud computing provider go broke or get acquired and swallowed up by a larger company<sup>8</sup>.

### CONCLUSION

Cloud Computing became a buzzword nowadays. More and more companies step into cloud and provide services above on it. However, security and privacy issues impose strong barrier for users' adoption of cloud systems and cloud services. There is no doubt that the cloud computing is the development trend in the future. Cloud computing brings us the approximately infinite computing capabilities, good scalability, service on-demand and so on, also challenges at security, privacy, reliability and so on. More security strategies should be deployed in the cloud environment to achieve the 5 goals i.e. availability, confidentiality, data integrity, control and audit, as well as privacy acts should be changed to adapt a new relationship between users and providers in the cloud literature. We claim that prosperity in Cloud Computing literature is to be coming after those security and privacy issues are resolved.

To summarize, the cloud provides many options for the everyday computer user as well as large and small businesses. It opens up the world of computing to a broader range of uses and increases the ease of use by giving access through any internet connection. However, with this increased ease also come drawbacks. You have less control over who has access to your information and little to no knowledge of where it is stored. You also must be aware of the security risks of having data stored on the cloud. The cloud is a big target for malicious individuals and may have disadvantages because it can be accessed through an unsecured internet connection.

<sup>4</sup> Elinor Mills, "Cloud computing security forecast: clear skies",

<sup>5</sup> Jianchun Jiang, Weiping Wen, "Information Security issues in cloud computing environment",

<sup>6</sup> Eucalyptus Completes Amazon Web Services Specs with Latest Release,

<sup>7</sup> OpenCloudComputing.org

<sup>8</sup> Gartner, "Seven cloud-computing security risks".

If you are considering using the cloud, be certain that you identify what information you will be putting out in the cloud, who will have access to that information, and what you will need to make sure it is protected. Additionally, know your options in terms of what type of cloud will be best for your needs, what type of provider will be most useful to you, and what the reputation and responsibilities of the providers you are considering are before you sign up.

The three different service models for the delivery of cloud computing, IaaS, SaaS, and PaaS, provide enterprises with the ability to mix and match the best service model to the business needs of their organization based upon requirements and payment options.

Cloud Computing is a term that doesn't describe a single thing – rather it is a general term that sits over a variety of services from Infrastructure as a Service at the base, through Platform as a Service as a development tool and through to Software as a Service replacing on-premise applications. For organizations looking to move to Cloud Computing, it is important to understand the different aspects of Cloud Computing and to assess their own situation and decide which types of solutions are appropriate for their unique needs.

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## SECURITY COMPONENT IN WEB DECISION SUPPORT SYSTEMS FOR LOCAL ECONOMIC ANALYSIS

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**Abstract:** The essential aim of the research in the field of local economic development is to assess the determinants of business environment at the local level. When it comes to the business environment are two main stakeholders which can make favorable business environment through their joint efforts - local government institutions and business community. The paper describes a web decision support system (DSS) whose purpose is to collect and analyze data on business community opinion about some public services and work of local institutions. The results of data analysis should provide information for deciding on future actions of local authorities to improve public services and the work of local government institutions. A special issues of the functioning of the Web DSS is data security and prevent misuse. The paper will be considered possibilities to prevent system attacks by both internal and external attackers.

**Keywords:** Business Environment, Business Community, Local Government Institutions, Web DSS, Data Safety

### INTRODUCTION

Extremely large regional differences and the lack of local economic policies, imposed the issue of improving local economic environment as a matter of urgency. The state of the local business environment has a direct impact on economic activity in the local self-government unit, but as well on the local GDP that has been generated or employment and average wages that are realized in it. In creating the business environment at the local level are the two dominant stakeholders: the business community and local self-government institutions. Improving communication between these stakeholders can greatly affect the positive trends in the business environment.

In order to improve the communication between businesses community and local institutions, the generally accepted way of collecting and analyzing data are so called business-to-government platforms. This is the principle of using websites to exchange information which will be used by institutions in order to advance their mode of action and become efficient and effective. At the other hand, the information can be used by business community to obtain relevant information from the local institutions that they could facilitate and improve their operations. Increasing problems resulting from the lack of communication between institutions, both state and local, and business entities, led to the development of business-to -government systems. The type of platform is depending on the type of problem, but the essence is always the same and is related to relief and improved communication are two main parties in the process of creation of favorable business environment. Platforms can be designed to collect data through them for the institution or business, to present the information required to business community in order to do business better, and often contain both of these segments .

One of the most popular platform for collecting data on the local economic environment is the application of the World Bank for analysing opinion of the business community about

business conditions at the local level<sup>1</sup>. As a result of the analysis of data collected at the site can find reports on the business environment. Platform with focus on local business competitiveness is developed and Croatia with the aim of assessing the business climate within the project Local Business Environment Croatia<sup>2</sup>. The result of the analysis is to create a composite indicator of competitiveness of cities and their ranking in terms of the benefits of the business environment. The largest number of this type of platform has been developed in the United States. Some of the well known are the GSA Advantage<sup>3</sup> and Data.gov<sup>4</sup>.

This paper describes business to government platform called “Multi-Criteria Support System for Analysis of the Local Economic Environment”. The aim of technical solution “Multi-Criteria Support System for Analysis of the Local Economic Environment” is related to the analysis of the business environment of the City of Niš. Solving the problem can be identified criteria with the highest importance for the creation of a favorable business environment. The analysis is based on the perceptions and attitudes of the business community and the result is information for the local authorities on current issues and perceptions of entrepreneurs who do business in the city of Niš. The System has been developed in 2013 at the Faculty of Economics, University of Niš. So far, System is implemented at official home page of Society of Economists of Niš (<http://den.org.rs/>) and it is a decision support system for the research conducted by Society.

## DECISION SUPPORT SYSTEM FOR LOCAL ECONOMIC ANALYSIS

In the last decades, the business environment has become one of the significant issues of economic literature, which has been analyzed in a variety of micro and macro studies, in terms of national and international business, taking into account the impact of its strategic elements such as economics, administration and society. In all these studies, it is generally accepted that the business environment, along with the capacity of state and local institutions to create a favorable business environment, is the most important determinant that affects the intensity and quality of business activities. One of the primary purposes of state administration, when it comes to the domain of economics, is to provide a stable business environment. On the other hand, the role of local self-government institutions has almost marginalized in the conditions of the high level of centralization that exists in Serbia. Two of the most influential determinants on business activities are business environment and the state and local governments bodies' ability to deal with specific problems in creating stable and favorable business environment. Especially in the period of the recent economic crisis these two factors have been analyzed from many different aspects<sup>5</sup>. The main conclusions of all mentioned scientific papers and studies refer to the multiple influence of the business environment on the business activities and the crucial role of the state institutions in the developing an enabling business environment. Some other studies show that local governments are likely the primary policy makers and regulators that entrepreneurs and small businesses encounter<sup>6</sup>. Unfortunately, many local governments do not know the impact of their efforts or what their most effective roles should be. Too often, local regulations can unknowingly create institutional and bureaucratic barriers that impede development and the speed to market for new businesses<sup>7</sup>. Additionally, while most local governments have policies and programs designed to proactively support entrepreneurs and small businesses, these efforts are not necessarily well suited to meet the needs of the types of small businesses most likely to drive economic growth<sup>8</sup>.

Local self-governments are interacting with business community via its regulations, policies and communicatory and governance processes, as an important factor in supporting new and small business growth. Regulations affect doing business in a community and good communication

1 According to World Bank, Local Business Enabling Environment Survey Instrument

2 [www.lbecroatia.com](http://www.lbecroatia.com)

3 [www.gsaadvantage.gov](http://www.gsaadvantage.gov)

4 [www.data.gov](http://www.data.gov)

5 Bumgardner, M., Buehlmann, U., Schuler, A. and Crissey, J. (2011); Ciocarlan-Chitucea, A. and Popescu, D. (2010); Dunkelberg, C. and Wade, H. (2012); Grilli, L. (2011); Lavric, V. (2010); Lloyd, L., Mumby, R. and Sear, L. (2010); Nicolescu, O., Verboncu, I., Profiroiu, M., Nicolescu, C. and Anghel, F. (2010) and Nicolescu, O.; Nicolescu, C. (2013) and Norwood, S. (2011).

6 McFarland, Christiana, Katie Seeger and Geary C. (2010).

7 Roxas, H., Lindsay, V., Ashill, N., & Victorio, A. (2008) and Morris, R. J. & Brennan, G. P. (2003).

8 McFarland, Christiana K. and McConnell J.K. (2011).



between local institutions and business community helps establish trust, build supportive policies and provide ways to solve problems<sup>9</sup>. “Governments can, given their powers, have considerable influence over the entrepreneurial process by stifling the efforts of those attempting to start a new business. This may be done through onerous bureaucratic requirements, complex regulations or merely slow reaction to requests for decisions required to form a new business”<sup>10</sup>. The speed, efficiency and complexity of local regulatory processes are indicators of a local government’s responsiveness to the needs of business community.

When it comes to Serbia, the competencies of state institutions and local government institutions varies even more drastically. In fact, due to the high level of centralization, the operational capacity of local institutions in the area of creating a favorable business environment is small. On the other hand, previous studies have shown that the business community are still not perceived to local governments as partners but there is still a distance relationship, where the local authorities are considered as the category of “power”<sup>11</sup>. All jurisdictions of local institutions in the field of local economic development are relatively new and have not yet found the right model of action. In this context, this paper aims to identify some key issues of operation (in)efficiency of local institutions and thus improve the relationship between the business community and local government.

Realized technical solution that is the subject of this paper, gives notices on the attitudes of the business community referring to the local business environment. The analysis consists of two segments: (1) to analyze the importance of certain criteria for creating a favorable business environment, and (2) analysis of the fulfillment of these criteria in the respective local government, i.e. City of Nis. At the same time, formed a database of objective indicators of the business environment (the amount of investment, (un) employment, average wage and the working population) at the local level using official data of the Statistical Office of the Republic of Serbia<sup>12</sup>. System is managed by persons with administrative level access. Users access the application by clicking on the “Rating the business environment.” Users of the system (economic entities - interviewees) during approach are registered and create a user name and password. The subject of research is an analysis of the relevant criteria for assessing the business environment at the local level. This is exclusively research on the criteria whose fulfillment is in the domain of local government. The criteria that are within the competence of national institutions (such as tax incentives or subsidies) are not included in this study. By completing the questionnaire opinion of the business community is included in the analysis of this important issue. The identity of the respondents is anonymous and only visible to researchers - implementers of the project. The aim of the study is to determine economic policy at the local level, which would make the local authorities able to contribute, irrespective of the state institutions, in improving the business climate and thus contribute to an increase in economic activity.

The criteria based on which the evaluation of business environment is done in System are the same by which the National Alliance for Local Economic Development is conducting BFC process<sup>13</sup>: (1) Strategic planning of local economic development in partnership with businesses; (2) Special department in charge of local economic development (*LED*), *FDI* promotion and business support - existence of *LED* Office; (3) Business council for economic issues – advisory body to the mayor and local governments; (4) Efficient and transparent system for acquiring construction permits; (5) Economic data and information relevant for starting and developing a business; (6) Multilingual marketing materials and website; (7) Balanced structure of budget revenues/debt management; (8) Investing into the development of local workforce; (9) Cooperation and joint projects with local business on fostering *LED*; (10) Adequate infrastructure and reliable communal services; (11) Transparent policies on local taxes and incentives for doing business and (12) Electronic communication and on-line services. Visual presentation of on-line questionnaire is given on Figure 1.

9 McFarland, Christiana K. and McConnell J.K. (2011).

10 Reynolds, P., Storey, D. J., Westhead, P. (1994), pp. 447.

11 Stankovic J., Jankovic-Milic V. and Andjelkovic M. (2012)

12 <http://webzrs.stat.gov.rs/WebSite/>

13 Business Friendly Certification South East Europe (2013)



Figure 1. Visual representation of part of the questionnaire, “Criteria for assessing the business environment at the local level”

On the basis of the collected data, a procedure of determining weights in multi-criteria model is carried in order to make a significance assessment of each of the above-mentioned criteria for the economic improvement of the local environment.

### MULTI-CRITERIA BACKGROUND OF ANALYSIS

As the evaluation of business environment is performed on the basis of 12 different criteria, that this problem can be defined as a classic problem of multi-criteria analysis. The first segment of solving multi-criteria analysis problem is to determine the weights as the relative importance of each criterion in the model. The process of determining the relative significance of the criteria consists in defining and assigning a weight to each individual the criterion. Particular weight should be as accurate as possible to reflect the contribution of each criteria of income, and it is necessary to define the vector  $W = (w_1, \dots, w_j, \dots, w_m)$ , where  $w_j$  is the weight coefficient assigned to a criterion  $C_j$ . The sum of such a specific weight is equal to one, ie.  $\sum w_j = 1$ .

Determining the weights in this technical solution will be carried out using the method of entropy<sup>14</sup>.

Determination of objective weight criteria according to the method of entropy is based on the measurement of information indeterminacy contained in the decision matrix and directly generates a set of criteria weights based on mutual contrast of individual criteria attributes of all alternatives for each criterion and then, at the same time, for all the criteria

Let the data collected are sorted in the following decision matrix:

$$A = \begin{bmatrix} a_{11} & \dots & a_{1m} \\ \vdots & \ddots & \vdots \\ a_{n1} & \dots & a_{nm} \end{bmatrix} A = \begin{bmatrix} a_{11} & \dots & a_{1m} \\ \vdots & \ddots & \vdots \\ a_{n1} & \dots & a_{nm} \end{bmatrix} \quad (1)$$

<sup>14</sup> Entropy algorithm according to Shanon (1948)

where  $A_i$  ( $i=1,2,\dots,n$ ) are preferences of the  $i^{\text{th}}$  user (business entity) about the importance or the fulfillment of the observed criteria,  $C_j$  ( $j=1,2,\dots,m$ ) are criteria for evaluating business environment and the values  $a_{ij}$  are grades of importance and/or fulfillment of the  $j$ -th criterion expressed by the  $i$ -th user. System implies that the research must involve a minimum of 100 respondents, which means that in this model must fulfill the condition that  $n \geq 100$ . The anticipated period of data collection, which will provide a relevant sample, is one year. Also, a number of criteria to be analyzed is 12, which means that  $m = 12$ .

Determining the criteria weights  $w_j$  carried out in three steps<sup>15</sup>. In the first step, the normalization of the the coefficients  $a_{ij}$  is performed by applying following pattern:

$$r_{ij} = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}} r_{ij} = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}}, j = 1, 2, \dots, m \tag{2}$$

This procedure gives a normalized decision matrix:

$$R = \begin{bmatrix} r_{11} & \dots & r_{1m} \\ \vdots & \ddots & \vdots \\ r_{n1} & \dots & r_{nm} \end{bmatrix} R = \begin{bmatrix} r_{11} & \dots & r_{1m} \\ \vdots & \ddots & \vdots \\ r_{n1} & \dots & r_{nm} \end{bmatrix} \tag{3}$$

Quantity of information contained in the normalized decision matrix and the broadcast of each criterion  $C_j$  can be measured as the value of entropy  $e_j$  and it is calculated as:

$$e_j = -k \sum_{i=1}^n r_{ij} \ln r_{ij} e_j = -k \sum_{i=1}^n r_{ij} \ln r_{ij}, j = 1, 2, \dots, m \tag{4}$$

Where the constant  $k=1/\ln n$  has been introduced in order to find all the values of  $e_j$  in the interval  $[0,1]$ .

In a second step has been determined the degree of divergence of  $d_j$  by comparison to the average amount of information contained in each criteria:

$$d_j = 1 - e_j, j=1,2,\dots,m \tag{5}$$

The degree of divergence  $d_j$  is a inherent intensity of contrast of criterion  $C_j$ . The greater divergence of the initial criterion values of  $a_{ij}$  coefficients of alternatives  $A_i$  for a given criterion  $C_j$ , means that the  $d_j$  value for the given criterion is larger, and it can be concluded that the importance of observed criterion  $C_j$  for a given decision problem is bigger. If all interviewees have similar values of the degree of divergence of a particular criterion, then the criterion is less important for a given decision problem. Also, if all the values of the degree of divergence of respondents to a particular criterion of the same, given the criteria can be excluded because it does not bring new information to decision makers.

Since the value of  $d_j$  is a specific measure of the intensity of contrast in criterion  $C_j$ , the final relative weight of the of criteria in the third step of the entropy method, can be obtained by simple additive normalization of  $d_j$  coefficients.

$$w_j = \frac{d_j}{\sum_{j=1}^m d_j} w_j = \frac{d_j}{\sum_{j=1}^m d_j} \tag{6}$$

The method can be considered objective because it generates weighted criteria directly from criterion values expressed by interviewees and eliminates the problem of subjectivity, incompetence or lack of decision-maker. Also, the nature and type of criteria are not important.

<sup>15</sup> Feldman D.P (2002); Gray, R. M. (1990).

In this way, “Multi-Criteria Support System for Analysis of the Local Economic Environment” ensures that subjective preferences on the importance of the criteria expressed by interviewees (i.e. business community) are objectified through the weights assessment process.

Analysis of fulfillment of criteria is based on a statistical analysis of the data collected. The arithmetic mean is usually calculated measures of central tendency and a large number of statistical techniques in statistics inference using the arithmetic mean. It represents the average score in a distribution of results.

The arithmetic mean is the observed problem is calculated according to the formula:

$$\bar{c}_j = \frac{\sum_{i=1}^n a_{ij}}{n}, j = \overline{1,12} \bar{c}_j = \frac{\sum_{i=1}^n a_{ij}}{n}, j = \overline{1,12} \quad (7)$$

where  $n$  is the number of interviewees in the sample and  $\sum_{i=1}^n a_{ij}$  is the sum of all scores for the  $j^{\text{th}}$  criterion in the sample.

Based on the formula, has been obtained an average score of fulfillment of the  $j^{\text{th}}$  criterion in the City of Niš, expressed by business community. If the application is implemented in other cities in the Republic of Serbia, this information would be valid for the creation of composite indicators of the business environment in the observed city, and thus could be possible to compare and rank cities in terms of business environment.

At the bottom of the questionnaire is the command to record data “Save”. By entering this command the user enters the application where it can see the results. The results are presented in a single web page. At the top of the web page are presented results of research related to the importance of the criteria and ranking criteria in terms of their importance for creating favorable business environment. The second part of the web site contains a tabular presentation of scores for criteria fulfillment in the city of Niš.

The application thus provides information on the attitudes of the business community related to the local business environment and allows local institutions to respond efficiently and effectively to improve the criteria that have been detected as critical.

## SECURITY COMPONENT IN MULTI-CRITERIA SUPPORT SYSTEM FOR ANALYSIS OF THE LOCAL ECONOMIC ENVIRONMENT

Police departments in high-tech crime of many countries trying to deal with different kinds of threats and attacks in web systems, in order to reduce the negative consequences and losses resulting from a variety of criminal activities. In this process actively participate various international anti-criminal organizations and associations, but also “private sector” including individual users. Internet users are becoming a significant group in the creation of good conditions to protect their computer network, which act synergistically with the security state bodies in public, global networks<sup>16</sup>. The development of secure Internet infrastructure in today’s global, information society, it is hard to imagine without the joint activities of each of these stakeholders. Determining the overall concept of information security is certainly the first and indispensable step in meeting this goal.

The main goal to be achieved for the required information security is the provision of so-called trinity of CIA: an acronym of the words (1) Confidentiality - to ensure that only authorized personnel have access to information, (2) Integrity - whose achievement ensures that only authorized personnel can modify information, and (3) Availability - which ensures that authorized personnel have access to information whenever it is needed (Figure 2)<sup>17</sup>.

<sup>16</sup> Tanenbaum, A., Andrew, S. (1991).

<sup>17</sup> Randelović, D. (2013).



Figure 2. Trinity of CIA

Ensuring the confidentiality, integrity and availability, should be combined with providing physical security, achieving effective security solution. The task of the employees who are in charge of information systems as well as certainly experts in data security, is to provide reliable information to only those persons who have access and in time when they need access and thereby to minimize the chances of to minimize the chances to impair the CIA trinity in any way<sup>18</sup>.

Risk control is the process used to identify, control and mitigate the possible damage, i.e. to reduce the risk of maintaining CIA Trinity. To ensure the security of information is first identify the possible risks, then based on these reveal threats and vulnerabilities, and finally perform their minimization (Figure 3)<sup>19</sup>.



Figure 3. The process of risk control

Since the risk can never been fully eliminated, the risk is minimized by detection at first and then with the right plan for its reduction, such as reduce the number of copies of the most trusted information, reduce the number of locations where such information is stored, limit the number of people who access the information as well as the number of possible ways of access, and so on. Risk is the exposure to loss or possible damage to information and, unlike the concept of information security, implies the existence of the possibility that external factors threaten data. The threats in terms of information security are all activities that pose a potential threat to the information and appear in various forms. Weak points are flaws in the protection of information

18 Randelović, D. (2010).

19 Randelović, D. (2013).

in the information system and network, which is usually an integral part including all processes and procedures. Although the CIA trinity must be kept because of safety of information, it has not been done at any cost. There is a limit value for the information protection and therefore it is necessary to combine the knowledge of values, threats, vulnerabilities and risks, in order to create an effective and efficient plan. First of all it has been estimated the value of the information to be protected, then sets cost more potential risks, threats and vulnerabilities, and finally should be mitigate risks detected<sup>20</sup>.

In accordance with the principles described for providing security in web systems, Multi-Criteria Support System for Analysis of the Local Economic Environment has protection from both types of potential attacks: external and internal. Internal are related to those who have access to the very basis and essence of the abuse of power. Excluding social engineering (multimedia resources), the crime is solved by introducing a level of data availability and their control - authentication. Otherwise such crimes is very difficult to detect.

Another type of abuse, which is much more frequent interception of data in the network where there are a number of different attacks (hacking) and prevent these types of attacks are resolved strictly protected network, starting with the firewall and the detector network attacks.

Preventing abuses by users of the system is achieved by introducing procedures for application and user registration (Figure 4).

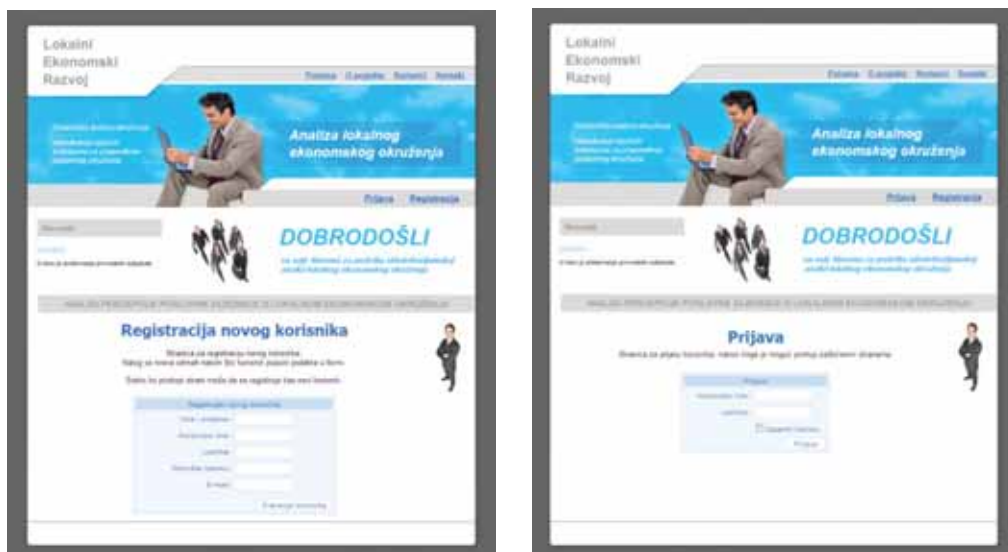


Figure 4. Preview of registration and subscription of System users

## CONCLUSION

This paper describes the business to government platform called “Multi-Criteria Support System for Analysis of the Local Economic Environment” developed in 2013 at the Faculty of Economics, University of Niš. The purpose of the platform is to improve the relationship between local authorities and the business community, with the aim of improving local business environment. The platform is designed as a decision support system, in which computational background is multi-criteria analysis and the method for determining the weights in multi-

<sup>20</sup> Tenhuen, M. (1989).

criteria model. The subject of the paper is to highlight the problems of preserving the security of information in these types of platforms and a description of the specific solutions applied in Multi-Criteria Support System for Analysis of the Local Economic Environment” in order to achieve the desired level of information security. In future research, the authors will present the results of research conducted with the assistance of the platform, as well as specific security problems that have occurred in its course of work.

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**TOPIC**

**SOCIAL, ECONOMIC AND POLITICAL FLOWS  
OF CRIME - MANIFESTATION,  
MEASURING AND ANALYSIS**

**DRUŠTVENI, EKONOMSKI I POLITIČKI TOKOVI  
KRIMINALA - IZRAŽAVANJE,  
MERENJE I ANALIZA**



## YOUTH DELINQUENCY IN BELARUS

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**Abstract:** Supported by the statistic data, official documents, and results of the opinion poll conducted by the authors the dynamics, state and trends of negative deviations and youth delinquent behaviour in the Republic of Belarus (from 1990 till 2012) are reviewed. From 2006 till 2007 in the Republic of Belarus a positive dynamics of general and youth crime decrease is observed. But these positive results of the government anti-crime activities are not so significant concerning youth delinquency. The crime rate among perpetrators of youth age annually exceeds the total crime rate by 10-14%. Success in reducing general and youth crime level is also negated because of the unfavourable demographic situation in Belarus, which since 1995 has been characterized by depopulation processes. Therefore, the most favourable indicator of the crime level in 2012 barely caught up with the indicators of early 90-ies by the crime rate.

**Keywords:** Deviations, delinquency, youth, administrative offenses, crimes.

### INTRODUCTION

Youth<sup>1</sup> delinquency has always been a sharp social problem. Only joint efforts of the law enforcement bodies, school, family and the whole society can resolve this phenomenon<sup>2</sup>. Such a social evil walks hand-in-hand with other negative deviations peculiar to adolescent persons.

Countering specified youth deviations is an important part of public policy, according to the provisions of the Article 32 of the Belarusian state Constitution, which is aimed at ensuring of normal intellectual, moral and physical development of youth; creation of necessary conditions for free and effective participation of young people in political, social, economic and cultural development; and, ultimately, at the provision of moral and social health of the nation<sup>3</sup>.

The state and dynamics of deviant and delinquent behavior of young Belarusians became an integral part of the target in the research on "Moral and legal culture of youth as a social deviations counteractor under conditions of innovation-driven development of the society". It was conducted by the authors in 2011-2013 under the Treaty made with Belarusian Republican Fund of Fundamental studies on 15/04/2011 (№ 097-G11OB). Some research results are placed below.

### DEVIATIONS AND DELINQUENCY

The dynamics and structure of deviations and delicts exist in close association and interdependence with socio-economic processes as well as with other processes occurring in the life of the Belarusian society.

Deviations (divergences from social norms) are a social phenomenon of a concrete historical nature. According to the academician V.N. Kudryavtsev, "every society is characterized by those forms of social deviations and those deviation scales, which are derived from the specific

1 Youth - citizens of the Republic of Belarus, foreign citizens and stateless persons permanently residing in the Republic of Belarus, aged 14 to 31 years (see the Law of the Republic of Belarus of 07/12/2009 № 65-3 «On the Basics of State Youth Policy», article 1).

2 Transcript of Remarks by the President of the Republic of Belarus Alexander Lukashenko at the meeting of pedagogical asset of Belarus on 29/08/2011.

3 The national legal Internet portal of the Republic of Belarus.

historical conditions of the society existence - social, economic, political, moral, etc. By the volume of socially deviant behavior, its structure, causes and trends of development we can infer the level of the social morality, the level of law and order, the social groups' cohesion degree...<sup>4</sup>.

Delinquency (negative deviation) should be regarded as anti-social and illegal behavior of the individual, doing harm to individual citizens as well as to the society in general. Different types of delinquent behavior are socially condemned and formalized by the government in the legal norms by describing the attributes, which characterize them, and by identifying them as delicts, which imposes certain legal penalties. Recognition of deviant behavior as delinquent is always associated with the activities of the government, which captures a particular action in legislation as a tort (delict)<sup>5</sup>.

According to the National Security Concept: changes in the life values of the younger generation towards weakening of patriotism and traditional moral values, youth crimes (including juvenile crimes) – are defined as internal threats to the national security in the social sphere<sup>6</sup>.

To get a foretaste of the current situation in the juvenile<sup>7</sup> and youth delinquency, we should analyze its state and dynamics, quantitative and qualitative characteristics of the administrative offences and crimes committed, which has a reflection in the official statistics and other sources.

## JUVENILE ADMINISTRATIVE OFFENCES AND OTHER JUVENILE SOCIAL DEVIATIONS

A special place in the system of deviations is taken by the juvenile administrative offences legally provided by the Belarusian Code of Administrative Offences (hereinafter - CAO). In 2008 31,512 juvenile administrative offences were registered in Belarus; in 2009 - 34,550; in 2010 - 28,208; in 2011 - 26,494; in 2012 - 24,054<sup>8</sup>. Most of them were connected with drinking alcohol in a public place and being in a public place in a state of alcoholic intoxication. In 2008, juveniles committed 9,029 such administrative offences (28.6% of all the juvenile administrative offences); in 2009 – 9,711 (28.1%); in 2010 – 10,652 (37.7%); in 2011 – 10,458 (39.4%); in 2012 – 8,832 (36.7%)<sup>9</sup>.

The process of the population alcoholization in Belarus acquires menacing proportions, which most directly affects the youth. In 1990 the alcohol consumption level indicator was 5.7 litres of absolute alcohol per capita, but by 2000 it increased up to 8.8 l., in 2008 reached 12.5 l. of abs. alcohol. In 2009 this figure slightly dropped (12.0 l.), but the following year grew up to 12.3 l. In 2012 this figure set up a new record of 13.0 l<sup>10</sup>.

From 2000 to 2011 the number of persons suffering from chronic alcoholism and alcoholic psychosis increased by 44.6% (from 1,426.9 up to 2,062.7 per 100,000 people). 17.143 juvenile alcohol consumers are registered and preventively supervised by the republican drug rehabilitation services, which indicates a particular ill-being of the society<sup>11</sup>.

4 Kudryavtsev, V.N. Dynamics of social deviance / V.N.Kudryavtsev // Social rejection. - 2nd ed., rev. and add. - M.: Legal. Lit., 1989. – P. 109.

5 Lukashova, O.G. Delinquent behavior / O.G.Lukashova, A.I.Lukashov // Sociology: An Encyclopedia. - Mn.: Book House, 2003. – P. 735.

6 National Security Concept of the Republic of Belarus approved by Presidential Decree of 09/11/2010 № 575, clause 32.

7 Juveniles - persons aged less than 18 years (see the Law of the Republic of Belarus of 19/11/1993 № 2570-XII “On the Rights of the Child”, article 1).

8 As the starting point we selected the year 2008, since which all the administrative offences have been evaluated in accordance with the CAO of 2001 that went into force on 03/01/2007. We took into account that the figures of 2007 are not fully comparable with the figures of 2008 due to the usage of the CAO of 1984 in the administrative offences qualification (*authors' note*).

9 Information about the administrative offenses committed by minors, for which the internal affairs authorities ordered the imposition of administrative penalties in 2008-2009; in 2009-2010; in 2010-2011; in 2011-2012.

10 Lukashova, O.G. Dissemination of alcohol abuse and alcoholism as a factor of personal degradation. - P. 204; Lukashova, O.G. On the Alcohol Policy in Belarus. - P. 215; Statistical Yearbook of the Republic of Belarus, 2012. - P. 472.

11 Board meeting of the General Prosecutor of the Republic of Belarus on the results of verification of compliance with the legislation on crime prevention, prevention of alcohol abuse and alcoholism, recidivism (Official website of the Prosecutor General); Health status of the population and health care organization in the Republic of Belarus (Official website of the Ministry of Health).

The second most common deviation in the youth circles is a *minor hooliganism* - actions, that violate public order, activities of organizations, comfort of citizens and demonstrate clear disrespect for society by using foul language, molesting citizens and other similar actions in a public place. In 2008 4,181 offences of this sort were detected; in 2009 - 3,773; in 2011 - 3,286; in 2012 - 2,829; in 2012 - 2,231.

The picture that characterizes the prevalence of such administrative offenses as *petty thefts* can hardly be considered as positive. In 2008 1,879 minor thefts committed by juveniles were recorded, but in 2009 their number decreased to 1,662, and in 2010 - to 1,583 cases. In 2011 this figure significantly increased again - up to 1,710 cases, and in 2012 fell to 1,403 such administrative offenses.

Teenage aggression finds its realization in fights, bashing acquaintances and other persons. Statistically, in 2008 645 cases of *intentional bodily harm infliction* by minors were identified. Further a tendency of a gradual reduction of this type of administrative offences takes place: in 2009 their quantity decreased to 536 cases, in 2010 - to 473, in 2011 - to 453, in 2012 - to 390<sup>12</sup>.

There is a certain dependence of the juvenile illegal actions prevalence degree on the actions of adults, who *commit offences against minors, involving them in illegal activities*.

Thus, in 2008 3,036 administrative offences with the involvement of minors in antisocial behavior (by parents and other persons) were registered. Subsequently, this figure rose up to 3,748 cases in 2009, then up to 4,843 in 2010 and did not decrease in the past two years. So, in 2011 - 5,313 such offences were registered, and even more in 2012 - 5,569 involvements of minors in antisocial behavior (since 2008 the figure has grown by 54.5%)<sup>13</sup>.

Thus, according to the data, teenager's social environment, which has an adverse impact on him, is a significant and intensifying factor of a negative impact on his deviant behavior.

The most important place in the process of legal socialization of youth is taken by a family. In the families conducting an asocial way of life, the probability of a children deviantization is very high. According to the data of the Ministry of Education more than 28,000 orphans live in orphanages and foster care homes, 86% of them are social orphans whose parents are deprived of parental rights. More than 30,000 children live in families at social risk<sup>14</sup>. In 2008 7,954 such administrative offences as *failure in child-rearing duties by parents* were detected, in 2009 this figure slightly decreased (7,772 administrative offences of this kind). In 2010 the quantity of such administrative offences went up to 8,211, in 2011 it remained at about the same level (8,248), and in 2012 it decreased to a level of 6,898 stated administrative offences<sup>15</sup>.

Youth deviance is also determined by such a widespread negative social phenomenon as drug addiction.

In the period from 1987 to 2012 (25 years) the number of *registered* drug addicts increased by a factor of 32.1. In 2012 the total number of drug addicts, *registered with drug rehabilitation institutions*, was 15,071 (by 8.9% more than in 2011 (13,8 thousand)). The total number of drug addicts within the country is about 150,000 people. Annually, the number of drug addicts increases by 600 people. The narcotization level is nearly 140 per 100,000 people. The age of the majority of drug addicts is under 35 years (84.5%), where: aged under 15 - 2.9%, aged 15 to 19 years - 10.3%, aged 20 to 24 years - 22.4%, aged 25 to 34 years - 48.9%. 52% of drug users are unemployed<sup>16</sup>.

12 Information about the administrative offenses committed by minors, for which the internal affairs authorities ordered the imposition of administrative penalties in 2008-2009; in 2009-2010; in 2010-2011; in 2011-2012.

13 Selected Indicators of Administrative Offences for 2008; 2009; 2010; 2011; 2012. - Minsk: Ministry of Internal Affairs of the Republic of Belarus.

14 Addiction - a serious threat to health (Official website of the Ministry of Health).

15 Selected Indicators of Administrative Offences for 2008; 2009; 2010; 2011; 2012. - Minsk: Ministry of Internal Affairs of the Republic of Belarus.

16 Health status of the population and health care organization in the Republic of Belarus (Official website of the Ministry of Health); Addiction - a serious threat to health (Official website of the Ministry of Health); Kurlovich, K. Number of registered drug addicts in Belarus for the year increased by almost 9%; Problematic issues of combating illegal distribution of narcotic drugs, psychotropic substances and their precursors (29/12/2011) (Official site of the Prosecutor General).



### YOUTH CRIME

Crime in Belarus over the past twenty years has acquired new qualitative and quantitative characteristics. From the early 90-ies up to 2005 crime had a negative trend of growth. Since 2006, there is a gradual decrease in the number of crimes within the country, which is recorded by the bodies of criminal statistics.

In 1990 there were 75,699 registered crimes (the crime rate<sup>17</sup> was equal to 742), but in five years this figure significantly increased. So, in 1995 there were 131,761 crimes registered (the crime rate – 1,290), and five more years later (in 2000) - 135,540 crimes (the crime rate - 1,355). This negative trend reached its peak in 2005, when there was a maximum quantity of registered crimes committed within the country in the contemporary history - 192,506 (crime rate - 1985) (see Table 1<sup>18</sup>).

	Registered crimes	Population (thousand people)	The crime rate
1990	75,699	10,188.9	742
1995	131,761	10,210.4	1,290
2000	135,540	10,002.5	1,355
2005	192,506	9,697.5	1,985
2006	191,468	9,630.4	1,988
2007	180,427	9,579.5	1,883
2008	158,506	9,542.4	1,661
2009	151,293	9,513.6	1,590
2010	140,920	9,500.0	1,483
2011	132,052	9,481.2	1,392
2012	102,127	9,465.2	1,078

Table 1. The dynamics of the registered crimes, the population (in abs. figures) and the crime rate in the Republic of Belarus (1990 - 2012).

As it is seen from the data, beginning with the years 2006-2007, a trend of reduction in both the number of recorded crimes and the crime rate takes place. At the same time it should be stated that the decrease in the number of registered crimes in 2006 and in 2007 (especially) happened partly in consequence of the repetitive minor theft decriminalization in 2006<sup>19</sup>.

The downward trend in the number of registered crimes remained until 2012. Meanwhile, the development of criminal processes happens in the demographic situation, which since 1995 has been characterized by depopulation processes, i.e. the country's population reduction (see Table 1). Till 2005 the absolute crime increase goes against the population reduction, but in 2006 a downward trend in the number of registered crimes coincides with a stable downward trend in the level of population, which to some extent makes a crime reduction tendency less pronounced. Comparative analysis of the above-mentioned indicators of crime rate and population indicates that the success in the crime reduction can hardly be called significant. The most favorable indicator of the crime level in 2012 barely caught up with the indicators of early 90-ies by the crime rate.

17 The number of crimes per 100,000 people (authors' note).

18 Statistical Yearbook of the Republic of Belarus, 2007. - P. 91, 291, 292; Statistical Yearbook of the Republic of Belarus, 2012. - P. 282, 283; Information on registered and sub judice crimes in 2012.

19 Law of the Republic of Belarus of 17/07/2006 № 147-3 "On amendments and additions to the Criminal Code, Criminal Procedure Code of the Republic of Belarus and the Code of Administrative Offences", article 9.

In Belarus, a demographic *group of young people aged 18-29* appears to be the most active in the sense of criminogenic activities. Their number in 1990 amounted 17.8 thousand people. By 2005, this figure more than doubled and rose to a maximum of 38.9 thousand people. In 2008, this age group numbered 33.0 thousand and in 2012 dropped to 22.7 thousand people.

A considerable number of crimes accounts for the *age group of persons aged 16-17*. In 1990, among all the identified perpetrators 5.0 thousand people were of this age group. This figure tended to increase until 1995, when it reached a magnitude of 5.9 thousand people. For a long time this figure remained about the same level (5.6 thousand in 2000, the same amount in 2004, and 5.4 thousand in 2005). Statistics started to entrench a reduction in the number of the identified perpetrators in this age group since 2006 - to 4.4 thousand people. In 2008 their number decreased to 3.5 thousand, and in 2012 - to 1.8 thousand people.

The number of perpetrators *aged 14-15* is twice less than the above-mentioned figure. In 1990 it was equal to 1.6 thousand people, in 2008 - 1.7 thousand, and in 2012 - 0.8 thousand people<sup>20</sup>. Lower crime rates in this juvenile age group are largely due to the fact that in this age the juveniles are criminally liable only for 21 crime types<sup>21</sup>.

There is also a downward trend in the youth quantity in the population structure. In 2012 their amount decreased by 5.7% compared with 2009, which affects the data on the number of identified perpetrators aged 14-29. Their number reduces (in 2012 it decreased by 33.7% in comparison with 2009). Furthermore, the rates of decrease in the number of the identified perpetrators aged 14-29 are much higher than the rates of decrease in the number of juvenile population (see Table 2<sup>22</sup>).

	2009	2010	2011	2012
Population aged 15-29 years	2,183,397	2,152,625	2,110,210	2,059,872
Identified perpetrators aged 14-29 years	38,200	36,200	31,465	25,339
Crime rate (the number of the identified perpetrators aged 14-29 years, per 100,000 people in this age group)	1,749	1,681	1,491	1,230

*Table 2. The dynamics of the population aged 15-29, the number of identified perpetrators aged 14-29 (in abs. figures), and the index of criminality in the stated age in the Republic of Belarus (2009-2012).*

The positive dynamics of decrease in the number of the identified perpetrators of this age is indicated by the youth crime rate, that decreased by 29.7% in 2012 compared to the same index in 2009.

However, there is another fact that draws our attention. The crime rate among the perpetrators aged 14-29 each year exceeds the total crime rate, shown in the Table 1: in 2009, the crime rate among the perpetrators aged 14-29 exceeded the total crime rate by 10.0%, in 2010 - by 13.3%, in 2011 - by 7.1%, in 2012 - by 14.1%.

20 Statistical Yearbook of the Republic of Belarus, 2012. - P. 285; Law of the Republic of Belarus of 17/07/2006 № 147-3.

21 Criminal Code of the Republic of Belarus, article 27.

22 Statistical Yearbook of the Republic of Belarus, 2012. - P. 97, 285; Information on registered and sub judice crimes in 2012.

## CRIMINAL RECORD OF YOUTH AGE INDIVIDUALS

Both the proportion and absolute numbers of the *juvenile convicts* among the whole amount of people convicted by the state courts tend to decrease. Thus, in 2005 the proportion of juveniles among the convicted was 6.8% (5,254 people), in 2008 it dropped to 6.5% (4,484). The last two years kept this dynamic remain: in 2011 the proportion of juvenile convicts rose to 3.6%, (1,978 people), but in 2012 the figures showed the lowest level of 2.7% (1,103 people)<sup>23</sup>.

Socio-demographic group of individuals aged 18-29 comprises a considerable part of all the convicts. In 2009 the proportion of them was 45.7% of all the convicts, in 2010 - 44.7%, in 2011 - 43.7%, in 2012 - 43.8%, and together with juveniles (4.3% of all convicts in 2009, 3.3% in 2010, 3.6% in 2011 and 2.7% in 2012) youth delinquents make a half of all persons convicted for offences (50% in 2009, 48% in 2010, 47.3% in 2011 and 46.5% in 2012)<sup>24</sup>.

Gender composition of the juvenile convicts is mainly represented by boys. The number of females tends to decrease (for example, in 2010 - 9.0% (185 people), 2011 - 7.1% (140 people), 2012 - 6.5% (72 people)). Almost one in four of those convicted refers to the youngest age group (14-15-year-old offenders), but their proportion steadily decreases both in absolute and relative figures (in 2010 - 530 people or 25.8%, in 2011 - 469 people or 23.7%, in 2012 - 234 people or 21.2%).

A greater part of juvenile convicts was raised in *two-parent families*. In single-parent family less than a third of the juvenile convicts were brought up (653 people or 31.9% in 2010, 598 people or 30.2% in 2011, 371 people or 33.6% in 2012)<sup>25</sup>. These data refute the stereotyping over a direct dependence between behavioral deviations of the juveniles and the lack of one of the parents. Obviously, the family structure does not have such a significant impact on young people's behavior as compared to the nature of the family relationships.

Relatively a small number of juvenile convicts lived in foster homes and other places outside the family (101 people or 4.9% in 2010, 108 people or 5.4% in 2011 and 64 people or 5.8% in 2012)<sup>26</sup>. Young students pose family disadvantages on the second place among the factors that can provoke young people to commit offences (60.1% of the respondents)<sup>27</sup>. Meanwhile, the higher the education level of the respondents, the more important, in their opinion, is this factor in the determination of wrongful youth behavior: from 54.2% in the group of vocational schools students and 59.2% in the group of students in specialized secondary schools to 66.9% in the control group of law students in the higher education institutions (HEI) (see Table 3).

23 Statistical Yearbook of the Republic of Belarus, 2012. - P. 288; Information about juvenile offenders in 2005; in 2010; in 2011; in 2012.

24 Information about the composition of convicts, place and time of committing crimes in 2009; in 2010; in 2011; in 2012; Information and reference materials on the results of official activity of the Ministry of Internal Affairs for 2012.

25 Information about juvenile offenders in 2010; in 2011; in 2012.

26 Ibid.

27 Here and below see the data of the opinion poll conducted by the authors in the institutions of education in January-February 2013 in Belarus (hereinafter - the Survey of 2013) (*authors' note*).

<i>Cause factors of youth offences commission</i>	<i>Law students</i>		<i>Students of the higher education institutions</i>		<i>Students of the specialized secondary schools</i>		<i>Students of the vocational schools</i>		<i>Total</i>	
	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%
Alcohol or drug intoxication	1	80.0	1	78.6	1	75.4	1	85.9	1	80.0
Family disadvantages	2	66.9	2	60.7	2	59.2	2	54.2	2	60.1
Personal benefit	3	51.5	4	46.4	5	43.7	3	38.0	3	44.8
Desire of self-affirmation	4	48.5	3	47.9	4	44.4	4	35.2	4	43.9
Low morality level	5	44.6	5	37.9	10	26.8	13	12.0	8	30.0
Impersonation of "authority"	6	42.3	7	29.3	3	48.6	5	33.8	5	38.4
Searching for thrills	7	38.5	8	25.7	7	35.9	6	32.4	6	33.0
Unwillingness to drop behind the others	8	38.5	6	32.9	6	37.3	10	20.4	7	32.1
Legal nihilism, ignoring the rule of law	9	29.2	13	13.6	11	22.5	15	9.2	13	18.4
Impunity	10	29.2	10	23.6	8	35.9	7	26.1	9	28.7
Too much (unorganized) leisure time	11	28.5	9	25.0	16	12.7	12	12.7	12	19.5
Negative influence of older persons	12	26.2	12	15.0	9	33.1	9	21.1	10	23.8
Inability for self-control	13	20.8	11	20.0	12	26.8	8	21.8	11	22.4
Desire to have fun	14	17.7	15	12.1	13	21.1	11	15.5	14	16.6
Excessive violence on TV, in the movies	15	13.1	14	12.9	15	13.4	14	11.3	15	12.6
Weak control from the side of the law enforcement bodies	16	7.7	16	5.7	14	16.9	16	9.9	16	10.1
"Softness" of the law, mild penalties	17	6.9	17	3.6	17	7.7	17	5.6	17	6.0

*Table 3. Opinions of students and pupils on the causes of the offences committed by youth (rank, %).*

As mentioned above, the juvenile alcohol drinking increases the likelihood of the deviant behavior. Thus, there is a significant fact, that more than a quarter of the juvenile convicts *committed crimes in a state of alcohol intoxication*, although the proportion of such persons gradually declines over the recent years. In 2010 there were 653 people (31.9%), in 2011 - 622 people (31.4%), and in 2012 - 294 persons (26.6%)<sup>28</sup>.

According to the major respondents opinion in all the groups participated in the Survey of 2013 (80.0%), alcohol or drug intoxication is the leading factor, pushing youth to commit offences. A special emphasis on such a circumstance was done by the students of vocational schools (85.9%), where drug and alcohol abuse is common.

More than a half of juvenile offences are committed by the groups of juveniles or with the participation of adults. Meanwhile, there is a prominent tendency of an increase in the proportion of such criminal performances. In 2010 51.5% of juvenile offenders were convicted for the collective crimes in the company of their mates, and 22.5% for the crimes with the participation of adults, in 2011 the number of such persons increased and amounted 54.0 (+ 4.5%) and 23.8% (+ 1.3%) respectively, and in 2012 grew - 58.3 (+ 4.3%) and 24.0% (+ 0.2%) respectively<sup>29</sup>.

The above-mentioned data on the negative impact of the environment on the youth criminal behavior correspond to the results of the Survey of 2013. Thus, 32.1% of respondents point out, that young people commit offences due to the desire to keep up with the others. The determining value of this factor is indicated by 38.5% of law students as compared to 20.4% of vocational school students.

Such circumstance as the negative impact by older persons on the youth illegal behavior did not go unnoticed by the respondents. In order of importance, it took the tenth place among the other determinative factors (23.8% of respondents). The importance of this factor is even higher in the assessments of law students (26.2%) and students of specialized secondary schools (33.1%).

The criminal record of youth age individuals is also associated with the state of the labor market. Among the officially registered unemployed people youth is a significant age group, although in recent years it tends to decrease. Thus, in 2000 the proportion of youth aged 16-19 among the unemployed was 53.9%, in 2011 it dropped to 38.5% of all the unemployed standing at the labor exchange, in 2012 the proportion of the unemployed youth was 37.7%<sup>30</sup>. The lack of a stable source of livelihood in the form of a stable salary greatly increases the "gap" in the youth capabilities to meet the needs and may adversely affect the increase in the level of youth delinquency. No wonder the unemployed constitute one of the most criminogenic groups in society. For example, in 2012 among those who committed crimes the proportion of notworking and notstudying persons was 56.8% (30,117 people). Compared to 2011 (37,197 people) it decreased by 19.0%<sup>31</sup>. Criminal record statistics indicate an increase in the number of able-bodied convicts, notworking and notstudying on the day of crime (44.8%, or 18,091 convicts in 2012<sup>32</sup>, 43.5% or 23,866 convicts in 2011<sup>33</sup>).

## CONCLUSION

Statistics indicates a sufficiently large number of administrative offences and crimes committed by the juveniles and other youth persons. Up to half of those convicted of crimes are persons of youth age (47.3% in 2011 and 46.5% in 2012, the proportion of juveniles is 3.6% of all persons convicted in 2011 and 2.7% - in 2012).

There is a positive trend (decrease) in the level of the identified offences, which were committed by the persons of youth age, and in the number of persons in this age group, against which the sanctions of administrative or criminal responsibility were applied (for example, in 2012 the youth criminality rate decreased by 29.7% relative to this figure in 2009). However, the remaining depopulation processes in Belarus negate this positive trend to some extent.

The data on the youth criminality rate resulting from the research turn out to be disturbing.

<sup>28</sup> Information about juvenile offenders in 2010; in 2011; in 2012.

<sup>29</sup> Ibid.

<sup>30</sup> Statistical Yearbook of the Republic of Belarus, 2012. - P. 160; Employment and unemployment (Official site of the National Statistics Committee).

<sup>31</sup> Information and reference materials on the results of official activity of the Ministry of Internal Affairs for 2012.

<sup>32</sup> Information about the composition of convicts, place and time of committing crimes in 2012.

<sup>33</sup> Information about the composition of convicts, place and time of committing crimes in 2011.

This rate annually exceeds the total criminality rate (in 2009 - by 10.0%, in 2012 by 14.1%), which requires an increase in the level of activities preventing the youth illegal actions together with their continuous improvement.

The effect of high levels of the alcohol consumption in the Republic on the state of deviant and delinquent behavior among the young is great, and is manifested in the crimes committed in the state of intoxication (almost a third of juveniles are convicted). According to the opinion of the majority of respondents in all the poll groups participated in the Survey of 2013 (80.0%): alcohol or drug intoxication is the leading factor (determinant), pushing youth to commit offences.

More than a half of juvenile crimes are committed by a group of juveniles or with the participation of adults. Meanwhile, there is a prominent tendency of increase in the proportion of such criminal phenomena, which requires an appropriate response from the government.

The negative impact of the unemployment on the state and level of the youth illegal behavior still remains (for example, in 2012 the proportion of youth aged 16-19 among the unemployed was 37.7%, and the proportion of notworking and notstudying persons among the convicts - 56.8%, and 16.3% among the juveniles).

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## TWO THEORETICAL CONCEPTS: 'CRIMINALISTIC STRATEGY' AND/OR 'STRATEGIC APPROACH IN CRIMINAL POLICE WORK'- WHICH OF THESE TWO GIVES MORE?

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**Abstract:** This paper primarily focuses on basic stands related to the concepts: strategic actions of criminal police and criminalistic strategy found in the literature. Additionally, it treats questions related to the structure of criminalistic strategy, relation between criminalistic strategy, criminalistic tactics and criminalistic methodics and other strategic approaches in police, different kinds of methods applied in the strategic approach. Finally, similarities, differences, theoretical and practical consequences between concepts 'criminalistic strategy' and 'strategic approach in the work of criminal police' are discussed.

**Keywords:** criminal police; criminalistic strategy; strategic approach

### PRELIMINARY DISCUSSIONS

Term criminalistic strategy (or strategy of criminal investigation), as a specific approach to crime control which is, per definitionem, broader and wider by far than traditional reactive approach is not generally accepted in criminalistics (criminal investigation) and not researched enough. When it comes to content and the meaning of the term, the views are different: is there a place for it in the criminalistics science? If this term enters criminalistics the question is where is its place (or does it have it at all) in criminalistics' structure; what kind of relation is there between it and other similar terms and institutes within criminalistics etc?

### STRATEGIC CONDUCT OF CRIMINAL POLICE IN THE COUNTRIES OF ANGLO-SAXON AREA

In the English speaking countries terms criminalistic strategy and criminalistics are not used as they are in continental part of Europe. Instead of criminalistics the English speaking countries use the term criminal investigation. There is no term criminalistic strategy. Numerous expressions which comprise similar, but somewhat broader content are used (crime control strategy, strategic policing etc.) It is necessary to emphasize that in these countries it is not questionable that criminal police have to maintain strategic approach in their work. There is a whole line of concepts which are generally accepted in science and practice and they are based on the idea of strategic approach in the work of criminal police. For example, community policing<sup>1</sup>; the concept of problem-oriented policing<sup>2</sup>. Intelligence Led Policing –ILP had the most important influence on development of learning about strategic approach in criminal police work. Ratcliffe specifically pointed to the significance of strategic approach within ILP.<sup>3</sup> Strategic use of criminal intelligence information is incorporated in system roots of British national intelligence model.<sup>4</sup> In other papers it was written about these concepts in detail.<sup>5</sup>

### STUDYING ABOUT CRIMINALISTIC STRATEGY IN GERMANY

During the eighties and the nineties, of the last century in Germany, started the publishing of researches about criminal forecast and criminalistic strategy as comprehensive approaches

<sup>1</sup> Trojanowitz, R., Bucqueroux, B.: *Community Policing, How to Get Started*, Anderson Publishing co. Cincinnati, 1994; Palmiotto, M.: *Community Policing, A Policing Strategy for the 21 st Century*, An Aspen Publication, Gaithersburg, 2000.

<sup>2</sup> Skogan, W., at all: *On the Beat, Police and Community Problem Solving*. Westview Press, Oxford, 1999; Goldstein, H. *Problem-Oriented Policing*, McGraw-Hill. Inc., New York, 1990.

<sup>3</sup> Ratcliffe, J.: *Intelligence-Led Policing*, Willan Publishing, Devon, 2008, p. 8.

<sup>4</sup> See Guidance on the National Intelligence Model (NIM 2005).

<sup>5</sup> for example Simonović, B.: Nove metode kriminalističkog planiranja, *Bezbednost*, broj 5, 2002a, 685–716.; Simonović, B., Mitrović, D.: *Saradnja u okviru kriminalističkog obaveštajnog rada*. U: Matijević, Mile (ur.). *Međunarodna i nacionalna saradnja i koordinacija u suprotstavljanju kriminalitetu: zbornik radova*, Banja Luka 22-23. oktobar 2010. Banja Luka: Internacionalna asocijacija kriminalista, 2010, pp.199-222.

which aim to see further and deeper than operative analysis was able to do.<sup>6</sup> At the end of 1997 in the German Ministry of Interior (*Bundeskriminalamt*) development of a project on strategic analysis of crime began - *Strategische Kriminalitätsanalyse – SKA*.<sup>7</sup>

While defining the term criminalistic strategy, that is, in its differentiation from other strategic approaches for affecting crime, two concepts can be observed. According to the narrow one, criminalistic strategy consists only of those measures which are based on application of criminalistic methods.

According to the second, wider concept, application of criminalistic strategy is not restricted to application of criminalistic measures and actions only. For example, one of the definitions from the second group was given by German authors Klink and Kordus in 1986. According to them, criminalistic strategy is science about method of targeted actions (influence) on criminal behaviour, whole crime complex or just one specific field. Criminalistic strategy is one scientific field which studies ways of directing preventive and repressive tasks in fight against the crime helped by global, planned (long-term, mid-term and lon-term) measures while improving its efficiency level. Preventive and repressive activities are undertaken in order to fulfill these aims. These activities can be criminalistic, or they can be of some other kind, such as economic activities, social activities etc. According to this concept criminalistic strategy isn't important just for criminal police, but for other authorities as well such as investigative judges, and prosecutors.<sup>8</sup>

In some German textbooks of criminalistics, the criminalistic strategy is a part of criminalistics' structure along with criminalistic tactics, criminalistic technique and criminalistic methodics.<sup>9</sup>

In German field of criminalistics, term criminalistic strategy and the need of its introduction etc. are not discussed anymore, since this is considered a resolved matter. However, papers are being published about certain specific issues related to further development of criminalistic strategy methods and their implementation in practice. For example, papers about introduction of contemporary strategic management in managing the work of criminal police<sup>10</sup>, strategic analysis of risk, application of scenario techniques in order to identify and quantify trends in the surrounding and to facilitate criminal police strategic forecasting and planning<sup>11</sup>; about application of statistical methods in the work of criminal police in order to improve strategic approach<sup>12</sup> etc.

## STUDYING ABOUT CRIMINALISTIC STRATEGY IN THE COUNTRIES WHICH ARE INFLUENCED BY SOVIET AND RUSSIAN CRIMINALISTICS SCHOOL

In Russian criminalistics literature and in criminalistics literature of the countries in which Russian school of criminalistics (former Soviet school) has primary influence, an opinion that classic division of criminalistics into four parts (into general criminalistics, criminalistic technique, criminalistic tactics and criminalistic methodics) is outdated can be found. There are authors who think that significant changes have occurred, which led to reviewing of general concept about the nature and system of criminalistics.<sup>13</sup> Two different directions appeared among authors who think that classic four-parts structure of criminalistics is outdated and that something needs to be changed, and these directions will be mentioned in this paper.

6 for example Kube, Störzer, Tim (Hrsg.): *Kriminalistik, Handbuch für Praxis and Wissenschaft, Band 1*, Stuttgart, Richard Boorberg Verlag, 1992, pp. 104, 139.

7 Stübert, D. F.: *Strategische Kriminalitätsanalyse im BKA, Kriminalistik*, 6/1999, p. 397-383.

8 see Dvoršek, A.: *Kriminalistična strategija*. Ministry of Internal Affairs, Faculty of Criminal Justice and Security, Ljubljana, 2001, pp. 20.

9 for example Kube, Störzer, Tim: *op. cit.*, pp. 3.

10 Kluge, R., Stiermann, C.: Die Etablierung eines indikatorgetriebenen Ansatzes im strategischem Management des BKA, *Kriminalistik*, 63 (11), 2009, pp. 631-634.

11 for example Lehmann, A., Berresheim, A.: Die Strategische Risiko-Analyse (SRA), *Kriminalistik*, 63 (7), 2009, pp. 396-402.

12 Mischkowitz, R., Becker, H.: Die neue Polizeiliche Kriminalstatistik. *Kriminalistik*, 65 (5), 2011, pp. 308-313.

13 Ищенко, Е.П.: К вопросу о природе и системе науки криминалистики, *Криминалист, Журнал Національного університету „Юридична академія України імені Ярослава Мудрого“*, Харків, 7, 2013, стр. 17.

According to one opinion, whose main representative is Russian author (criminalist) Filippov, the fifth part which deals with organization of revealing and investigating criminal acts should be added in the existing four-part division.<sup>14</sup> According to Filippov, the opinion that the fifth part needs to be added to the structure of criminalistics was adopted in 2003 by the section of criminalistics within Russian Ministry of Internal Affairs. A concept which was accepted within this section, was that along with general criminalistics, criminalistic techniques, criminalistic tactics and criminalistic methodics a part called 'organization of detection and investigation of criminal acts' should be introduced. This part of criminalistics would consist of:

- general knowledge;
- mutual relations among investigators, police authorities and other participants in detection and investigation of criminal acts;
- obtaining help of citizens and media in disclosure and investigation of criminal acts;
- work of investigators;
- criminalistic files (used term is 'учеты');
- counteraction to investigation and prevention measures,
- prophylactic work of the investigators<sup>15</sup>.

Upon these grounds a textbook named 'Criminalistics' (2007) was made in the redaction of Ищенко, Е.П., Филиппов, А.Г. and in it, in chapter five, there is a thoroughly elaborated part dealing with organization of detection of criminal acts.<sup>16</sup>

The leading Russian criminalist Belkin thinks that the introduction of 'organization for detection and investigation of criminal acts' in the structure of criminalistics isn't contributing to the development of this science, since it doesn't bring anything new, because criminalistics itself basically deals with organization of criminal acts' investigations.<sup>17</sup>

According to another opinion, which some authors (criminalist) represent, terms 'strategy' and 'strategic' are used in literature to emphasize significance of problems, aims, directions and the nature of planned criminalistic investigation.<sup>18</sup> The most significant representative of this opinion is Ukrainian criminalist Dulov who thinks that four part structure of criminalistics should be completed with the fifth part- which is criminalistic strategy. While criticizing Dulov's concept, Filippov emphasizes that almost every point, which according to Dulov represents part of criminalistic strategy's content, in reality is a matter and field of 'organization for disclosure and investigation of criminal acts' and that criminalistic strategy should find its own place within this part of criminalistics.<sup>19</sup>

One of authors (criminalist) who accepts the term 'criminalistic strategy' is Baev, who emphasizes that, just like many other terms which entered criminalistics from other sciences, term 'strategy' should be used in its interpretation with a certain level of conditionality.<sup>20</sup> 'There is no doubt that all the authors who explore phenomenon of strategy in various aspects of life point out that every strategy begins with cognition, designing and description of goals which activity is aimed to...'<sup>21</sup> As a consequence of his thinking about criminalistic strategy, Baev introduces the term 'final goal' and connects it to 'final goal of court's activity-achieving jurisdiction, determining the facts, that is, solving criminal conflicts (sentencing fair penalty, right to have proper defense etc.) ....etc.'<sup>22</sup>

The fact that authors use this term in many different ways, giving it different meanings<sup>23</sup>, in the very comprehension of the term 'criminalistic strategy', as well as in the sense of its

14 Филиппов, А.Г.: О криминалистической стратегии как самостоятельном разделе науки криминалистики, У: Кушниренко (ред.) *Криминалистика и судебная экспертиза: наука, обучение, практика*. Санкт-Петербург, 2012, стр.131.

15 *Ibidem*.

16 Ищенко, Е.П., Филиппов, А.Г.: *Криминалистика*, Москва, 2007, 124 and following.

17 Белкин, Р. С.: *Криминалистика: проблемы сегодняшнего дня. Злободневные вопросы российской криминалистики*. Издательство Норма (Издательская группа НОРМА—ИНФРА • М) Москва, 2001, pp. 72-74.

18 *Ibidem*, pp. 76.

19 Филиппов, А.Г.: *op. cit.*, pp. 133.

20 Баев, О. Я., Баев, М.О.: О конечных целях деятельности участников уголовного судопроизводства и стратегиях их достижения (к проблеме криминалистической стратегии). *Криминалист*, Журнал Национального университета „Юридична академія України імені Ярослава Мудрого“, Харків, 2012, pp. 12.

21 *Ibidem*, pp. 13.

22 *Ibidem*, pp. 13 and 15.

23 Белкин, Р. С.: *op. cit.*, pp. 74.



content<sup>24</sup> contributes to the confusion of determining and understanding the term 'criminalistic strategy' in the literature from this area. While some authors from this area think that criminalistic strategy is a part of criminalistics, the others don't accept this possibility. For example, Belkin opposes to this idea and he thinks that criminalistic strategy doesn't have general criminalistic content.<sup>25</sup> Belkin points out that criminalistic strategy represents modern comprehension of organization and planning of investigation, and if it was to become the part of crime studies about investigation planning, it could be reflected in the new name of the studies. At the end Belkin emphasizes: 'If concept of strategy would be free from some linguistic dilemmas (he used formulation 'некоторых языковых украшений и излишеств'), importance and usefulness of its various postulates would become obvious and doubtless.<sup>26</sup> However, apart from this, it remained unclear from Belkin's attitude whether he sees the difference between criminalistic acts' planning and making criminalistic versions on strategic and tactical levels, that is, on level of criminalistic methodology, and if he does, where does he see it.<sup>27</sup>

It is necessary to emphasize in the end that opinion of Dulov and the others who make the efforts to introduce term criminalistic strategy are not accepted in Russian criminalistics nor in criminalistics in countries under Russian scientific influence. Textbooks and papers based on four-part structure of criminalistics (general criminalistics, criminalistic technique, criminalistic tactic and criminalistic methodics) are still dominant.

### STUDYING ABOUT CRIMINALISTIC STRATEGY IN THE COUNTRIES OF FORMER YUGOSLAVIA

In former Yugoslavia region *texts about criminalistic strategy in Slovenia* appeared first (under the influence of German criminalistic school). The term criminalistic strategy as a counterpoint to strategy of criminals was used by Slovenian authors (criminalists) Maver (1989) and Dvoršek (1991, 1993) first. According to Dvoršek, 'criminalistic strategy is a field of scientific research which deals with planning and applying complete crime investigation measures, surveillance and crime prevention, with respect to political and legal frameworks of crime and efficiency principle'.<sup>28</sup> In another paper, Dvoršek indicates that criminalistic strategy represents field of scientific research which deals with the questions about how criminalistic measures and acts can be used to restrict crime globally, while considering political and legal frameworks of crime, as well as efficiency principle, that is, how to restrict crime as a whole, or its parts, and not particular criminal acts by using criminalistic measures and acts. Therefore, criminalistic strategy is aimed towards future crime and it is different from similar strategies for its criminalistic resources.<sup>29</sup>

Dvoršek particularly emphasizes that criminalistic strategy is recognized among similar strategies for its criminalistic resources. When differentiating term criminalistic strategy from the other fields which also have term strategy in their name (police, safety, general strategies in crime prevention), Dvoršek takes *criminalistic measures* as a differentiation criterion with which criminalistic strategy tries to fulfill its aims. That is why it enters the 'criminalistics' system.<sup>30</sup> The author divides criminalistic strategic orientations into repressively and preventively directed ones.<sup>31</sup>

Macedonian author (criminalist) Angeleski states that a strategy of an action in a specific field represents the most effective action tactic (applying the most optimal ways and methods) which is realized within the frames of a general platform or concept. Optimal, criminalistic, tactical, preventive and repressive action has to be based on global platform which represents criminalistic strategy. Global criminalistic strategy, as the most general programme oriented and planned framework for meaningful and scientifically based preventive repressive fight against

24 Баев, О. Ја., Баев, М.О.: *op. cit.*, pp. 10.

25 Белкин, Р. С.: *op. cit.*, pp. 80.; Баев, О. Ја., Баев, М.О.: *op. cit.*, pp. 10.

26 Белкин, Р. С.: *op. cit.*, pp. 80.

27 see Белкин, Р. С.: *Ibidem.*, pp. 80-81.

28 Dvoršek, A.: *Kriminalistična strategija*, Ministry of Internal Affairs, Faculty of Criminal Justice and Security, Ljubljana, 2001, p. 22.

29 Dvoršek, A.: *Značaj kriminalističke strategije za prevenciju kriminaliteta*, U: *Zbornik radova, Mesto i uloga policije u prevenciji kriminaliteta*, Policijska akademija, 2002, p.75- 79.

30 Dvoršek, A.: *Kriminalistična strategija*, *op. cit.*, p. 24.

31 Dvoršek, A.: *Značaj kriminalističke strategije za prevenciju kriminaliteta*, *op. cit.*, pp.78-79.

crime, at the same time implies theoretical foundation, as well as practical implementation of certain tactics and strategies of operative and process activities. Angeleski points out that these activities (operative and tactical) should be integrated into wider strategies and full strategic approaches. Criminalistic strategy is scientific and specific action against crime on global level or against group or special types of criminal acts.<sup>32</sup>

According to Angeleski, criminalistic strategy doesn't represent a separate part of criminalistics, and doesn't broaden its structure<sup>33</sup>, but is integrated in already existing three-part structure. Related to this matter, he states that theory of criminalistic strategy elaborates on theoretical and practical problems which arise from three part criminalistics' structure (tactics, technique and methodology).

While writing about criminalistic strategy's structure elements, Angeleski states that goals of criminalistic strategy could be divided into two parts: first- the ones fulfilled in the frames of so called practical operative criminalistic strategy and second ones which are immanent to theoretical criminalistic strategy.<sup>34</sup>

In Serbia (under the influence of German criminal school) the first person who published papers about criminalistic strategy was B. Simonović.<sup>35</sup> The subject that these papers researched was strategic planning as a part of studies of planning in criminalistics (along with tactical planning). In relation to this he stated that 'Strategic planning of criminalistic acts represents global approach within which certain types of crime are being analyzed (as well as criminality as a whole), conditions and causes which produce them, certain types of criminals and existing measures of crime control and repression, in order to detect general regularities, tendencies within specific criminal forms, as well as system weaknesses in organization and acting (taking) criminalistic measures with the aim to eliminate them, finding new preventive solutions, increase in repression efficiency, detecting and proving crimes.<sup>36</sup> In the criminalistics textbooks written by the same author, chapter about strategic planning is in general criminalistic part.<sup>37</sup> Studies about strategic planning represents only one part of criminalistic strategy. Strategic criminal planning is a general term which spreads through all parts of criminalistic strategy's structure and that's why it has its place within general studies of planning in criminalistics.

Under the term criminalistic strategy' Škulić implies rational and coordinated associating of powers and factors which deal with crime control. The key element of criminalistic strategy is long term planning which comes down to general overview of basic causes of criminal acts, analysis of typical delicts, and developing basic ways to crime control.<sup>38</sup> Concept that criminalistic strategy comprises preventive and repressive actions related to criminality on the certain territory which implies creation of organizational mechanisms and forms of institutional reacting to crime is right.<sup>39</sup>

## STRUCTURE OF CRIMINALISTIC STRATEGY

If criminalistic strategy represents an integral part of criminalistics as a field of scientific research, the question which arises is what is included in its structure.

Concerning the structure as a subject of research of criminalistic strategy, there are several approaches in the literature which (most often) don't exclude one another, but (to smaller or bigger extent) complete each other.

According to Dulov, criminalistic strategy consists of:

- Finding associates and defining the mutual relationships between them;
- Studying of general models and methods of criminal acts investigation;
- Studying general recommendation related to organization of criminal acts investigation;

32 Angeleski, M.: *Криминалистичка тактика*, Универзитет „Св. Кирил и Методиј Университу, Скопје, 2003, стр. 125-128.

33 Angeleski, M.: *Вовед во криминалистика*, Скопје, 2007, стр. 13-19.

34 Angeleski, M.: *Криминалистичка тактика*, *op. cit.*.

35 Simonović, B.: Nove metode kriminalističkog planiranja, *op. cit.*, str. 73-80; Simonović, B.: *Криминалистичка strategija*, *Zbornik radova nastavnika VŠUP-a*, 2002, 73-80.

36 Simonović, B.: Nove metode kriminalističkog planiranja, *op. cit.*; Simonović, B.: *Криминалистика*, Правни факултет, Kragujevac, str. 32.

37 Simonović, B.: *Криминалистика*, Правни факултет, Kragujevac, 2004, str. 32.; Simonović, B.: *Криминалистика*, Правни факултет, Kragujevac, 2012, str. 44.

38 Škulić, M.: Osnovi kriminalističke strategije. *Revija za kriminologiju i krivično pravo*, Institut za kriminološka i sociološka istraživanja, 49 (2-3), 2011, str. 82.

39 *Ibidem.*, 78-79.

Studying counteraction to criminalistic authorities and determining the ways to eliminate them.<sup>40</sup>

According to Angeleski, structure of criminalistic strategy, that is, the subject of its studying consists of:

Strategic meaning of tactical differential criminalistic diagnosis (determining a dark zone, *modus operandi*, *locus operandi*, etc.);

Strategic meaning of criminalistic prognosis;

Strategic meaning of criminalistic and criminological planning;

Strategic meaning of crime prevention (pre-crime prevention and post-crime prevention, police prevention, etc.);

Strategic meaning of criminalistic geographical analysis;

6. strategic meaning of criminalistic -informative projection (strategy of application criminalistic informative activities and control, strategy of operation with criminal data, sources of information, analysis, etc.).<sup>41</sup>

These parts that make a structure of criminalistic strategy Angeleski discusses in special subchapters of its „Criminalistic tactics“.

*Simonović*, defines criminalistic strategy as a holistic, comprehensive approach in the operation of criminal police with the aim to improve the control of specific types of crime and improve their own work. Final strategic goals of criminal police are to increase the effectiveness and efficiency of criminalistic work. Consequently, Baev's stand is not completely acceptable, as it introduces the term: „final aim of criminalistic strategy“ directly linking it to „final aim of court activity, that is, realization of judicial activities“. Strategic goals, in general, as well as strategic goals of criminalistic activity can be at different levels (have different type of hierarchy) depending on the type of the problem that is to be solved, i.e. depending on the field within which it is intended to make strategic improvements.

In accordance with the aforementioned, the structure, subject of criminalistic strategy (that is to say, strategic action of criminal police) includes the following widely drafted fields:

1. optimizing/improving the use of own resources and capacities (e.g. defining the best practice, improving technical capacities or (and) introducing new working methods; introducing new database and analysis software; determining priorities; optimization of resource allocation; eliminating weak points in the operation, further education, etc.);

2. developing a strategic partnership with other actors (*internal* partnership with other police departments and *external* partnership with the citizens, public authorities, e.g. public prosecutor, other security services, etc.);

3. strategic action on certain actors significant to accomplishing strategic goals in eliminating certain types of criminal acts (action directed towards potential victims, e.g. training; or action directed to potential criminals, e.g. keeping records, improving the control, etc.); and

4. identification/ exploitation/acknowledgement/ adjusting/ acting on the specific characteristics and tendencies within the criminal milieu, or social context e.g. comprehensive overview (analysis) of certain types of criminal acts (and changes in that area) from the aspect of improvement of control/repression and the role of police in the process; analysis of the price of the goods on criminal market in order to estimate efficiency of applied measures; analysis of the influence of certain social changes on the development of certain types of criminal acts and defining counter-strategies, etc.<sup>42</sup>, development of indicators, predictors, systems for early warning regarding specific criminal risks and strategic planning of counter-measures.<sup>43</sup>

Strategic areas within which strategic action of criminal police is realized (structure of criminalistic strategy) can be shown in other ways. For instance,: 1) improving the work of criminal police and (or) noticing and eliminating the weak points; 2) improving repressive methods of criminal police (that can be reactive and proactive), 3) improving prevention of specific types of criminal acts.

40 See Белкин, Р. С.: *Криминалистика: проблемы сегодняшнего дня. Злободневные вопросы российской криминалистики*, Издательство Норма (Издательская группа НОРМА—ИНФРА • М) Москва, 2001, стр. 77; Филиппов, А. Г.: О криминалистической стратегии как самостоятельном разделе науки криминалистики, У: Кушниренко (ред.) *Криминалистика и судебная экспертиза: наука, обучение, практика*. Санкт-Петербург, 2012, стр. 132.

41 Angeleski, M.: *Криминалистичка тактика*, op. cit., стр. 132-156.

42 compare: Simonović, B.: Istraživanje stavova pripadnika kriminalističke policije MUP-a Republike Srbije o strateškom pristupu suzbijanja kriminala. *Bezbednost*, Izdavač, MUP RS, 53 (1), 2011, str. 5-27; and Simonović, B.: *Kriminalistika*, Pravni fakultet, Kragujevac, 2012, str.49-50.

43 Kube, Störzer, Tim: op. cit., p.147-149.

It is important to emphasize that each of the mentioned (and not mentioned) strategic areas which are a part of a criminalistic strategy structure (strategic action of criminal police) represents a wide field for numerous independent researches, analyses and strategic improvements. The level of engagement in the areas where problems have been noticed and which demand strategic analysis and strategic action, to a great extent, affects the successful outcome of the realization of specific criminalistic activities. For example, lack of the system for anti-corruption control inside the criminal police directly affects the efficiency of undertaken criminalistic activities in revealing and clarification of certain criminal acts.

Ways of organization of certain criminalistic services or activities (operative and strategic management, criminal information systems 4X4 or 5X5, ways of organizing the flow of criminal information, introducing strategic analytics, apart from operative, etc.), have a direct effect on the rate of revealing certain criminal acts. Therefore, one part of the criminalistic strategy is an integral part of the organization for detecting and investigating criminal acts. Terms „organization“ and „strategy“ do not exclude one another, as some Russian authors imply, but they overlap and complement each other.

From the traditional point of view, criminalistics is determined as a science that works on detecting, prevention (prophylactics) of criminal acts. However in the structure of criminalistics, criminalistic repression is predominant (repressive methods and techniques). (Criminalistic) prevention, as a rule, is mentioned only generally in introductory chapters and it is a system that is not elaborated theoretically. This is due to, among other things, the fact that criminalistics as a science does not accept, acknowledge, research or develop fields that examine strategic approach in the work of criminal police. For instance, the strategy of working with victims of certain types of criminal acts (actual and potential victims), obtaining the support of the public in accomplishment of criminalistics goals in prevention and control of specific types of criminal acts do not appear even on the margins of criminalistics textbooks.

There is a huge number of strategic questions that have a direct or indirect influence on the efficiency of traditional criminalistic methods and measures. It is unbelievable that this, according to our opinion undisputable fact, should be proven separately.

### **RELATIONSHIP BETWEEN CRIMINALISTIC STRATEGY, CRIMINALISTIC TACTICS AND METHODICS AND OTHER STRATEGIC APPROACHES IN THE POLICE**

Criminalistic tactics and techniques are focused on the procedures of acting in the process of clarification of specific criminal acts (in general – tactics) or specificity with certain types of criminal acts (methodics). For example, general rules for investigation process or specificity of the investigation process of specific types of criminal acts.

Criminalistic strategy is focused on achieving „higher goals“ of different types and levels. At the lowest level, criminalistic strategy is focused on *improvement of the conditions* for undertaking certain operative or tactical actions (e.g. defining the best practice in performing certain actions; improvement of the work with the victims of criminal acts in order to improve cooperation and obtain quality statements; prevention of „information leak“), *introducing new methods* of work, etc. Angeleski pointed out that criminalistic strategy puts criminal tactical actions in a wider context, a general platform or a concept of a wider strategy, comprehensive strategic approaches, etc.<sup>44</sup>

Criminalistic strategy at higher levels is focused on improving the working conditions of criminal police as a whole or in certain segments (provided that it has a reflection on the increase of efficiency and effectiveness of criminalistic work). The aim of a criminalistic strategy is to identify and analyze weakness; define the best practice; improve the cooperation, i.e. partnerships (internal and external), etc. Criminalistic strategy is focused on removing the obstacles that hinder or distract the achievement of goals of criminal police in general or related to the work on specific types of criminal acts, which is reflected in the work on detection, clarification and prevention of crime.

Theoretically speaking, at highest levels, criminalistic strategy is, to some extent, transformed into some other strategies, or it overlaps with them to a greater or lesser extent, or it is

<sup>44</sup> Ангелески, М.: *Криминалистичка тактика*, op. cit., pp. 125-128.

(seemingly) lost, that is, integrates into higher-level strategies. At higher levels criminalistic strategy is transformed into police strategy, into general security strategy, etc. For instance, matters of HR (human resource) policy, reward system in the police, strategies of motivating police officers, anti-corruption strategies in the police are not criminalistic strategies in the narrow sense of the word, however, they have a certain influence, reflection on the work of criminal police department (that is to say on the work of police officers) in detecting and eliminating criminal acts. For this reason, it is sometimes hard to delineate (that is to say it is not possible and often there is no need) the so-called „criminalistic strategies“ from „police strategy“ or „strategies of police management“. This is one of the reasons why we think that the term „criminalistic strategy“ is not the best choice and that it is more precise to use the term „strategic action of criminal police“ or police strategies.

### METHODS OF CRIMINALISTIC STRATEGY

According to Dvoršek and certain German authors, criminalistic strategy is focused on the future criminality and it is different from related strategies by its criminalistic resources. According to Dvoršek the criterion for differentiation are *criminalistic measures* that criminalistic strategy uses to achieve its goals.<sup>45</sup>

This understanding is not completely acceptable for two reasons, to say the least. Firstly, criminalistic strategy is not focused only on future criminal acts, but also on improvement of the work of criminal police department. Eventually, this reflects in a more efficient criminal activity and future crime, as well, though, the problem which requires strategic action, strategic goal and project task have a completely different definition of focus.

Secondly, strategic action of criminal police in reaction to crime, or certain elements significant for its prevention, should not be related only to the application of criminalistic methods, criminalistic resources, criminalistic actions and measures, as mentioned authors do. The concept of strategy, by its nature, implies focus on the goal. The same goal can be reached in different ways, applying various measures that are available to criminal police. Grounds of the strategy are not methods and resources, but strategic goals which the subjects pursue to achieve. Therefore, it is more accurate to talk about strategic action of criminal police to achieve „higher“ goals that are not operational and tactical, and which are in accordance with the mission and the vision of criminal police and whose purpose, is to create a more efficient and effective reaction to crime.

We should bear in mind that the term „criminalistic strategy“ can lead to confusion, so it is perhaps better to use the term „strategic action of criminal police“, or „strategic measures undertaken by criminal police“ or „strategic behaviour of criminal police“. On the other hand, if the concept of criminalistic strategy is related only to the criminalistic actions and measures, this raises a question „what do they entail“ considering the fact that criminalistic methods are constantly upgraded with new approaches and methods. For example, according to the classic concept of criminalistics, problem-oriented work is not considered a criminalistic method. This raises a question can it be considered a criminalistic method today? Problem-oriented work, as a type of strategy, is applied in many fields and it is formed within the studies of contemporary strategic management. We believe, that in a wider sense, provided that criminal police use it adjustedly, it can be used within proactive action for the purposes of crime analysis and prevention. Thus, if we use the term „criminalistic strategy“, it should be clearly noted whether it is related to achieving strategic goals of the criminal police and it should not be limited only on criminalistic methods and measures in the narrow sense of the word.

In the accomplishment (achievement) of strategic goals, criminal police can apply: a) criminalistic methods and measures in the narrowest sense of the word, the way the mentioned authors say. In addition criminal police can: b) independently apply other available methods and measures which can not be considered criminalistics in the narrowest sense of the word (problem-oriented work, various analytical methods, statistical methods, scenario techniques); c) methods and measures that criminal police undertakes in partnership with the community or within a multiagency work with other state institutions or parts of society; d) and finally, crimi-

<sup>45</sup> Dvoršek, A.: Transnational Policing: The Globalization Thesis, a Typology and a Research Agenda, op. cit., pp. 24; Dvoršek, A.: Značaj kriminalističke strategije za prevenciju kriminaliteta, op. cit., pp. 75, 79.



nal police can only inform certain segments of the state/society about certain phenomena that require strategic action, having in mind that they are beyond the reach (jurisdiction) of criminal police.<sup>46</sup>

### **„CRIMINALISTIC STRATEGY“ AND (OR) „STRATEGIC APPROACH IN/TO THE WORK OF CRIMINAL POLICE“?**

Terms „strategic approach to the works of criminal police“, „strategic action of criminal police“ are more adequate than the term „criminalistic strategy“. Term criminalistic strategy can be focused on consideration (theoretical focus) of insisting on application of criminalistic methods for achieving strategic goals, which opens numerous questions and dilemmas, introduces confusion about terms, narrows the field of strategic action. As it is mentioned, strategy (for any problem of the research) is not focused on methods (methods are only means), but on accomplishment of strategic goals, that is to say on making changes at higher levels (acting on the phenomenon, i.e. on the problem at a higher level, rather than individually). For this reason, it is better to talk about strategic action of criminal police, about the necessity of a strategic approach to the work of criminal police, about the importance of strategic action in order to improve the work of criminal police that will consequently, result in achieving various strategic goals (one of which is higher efficiency and effectiveness in the work of police).

Terms „strategic action of criminal police“, „strategic approach to the work of criminal police“ comprise different strategies that, to a greater or lesser extent, directly or indirectly enhance the effectiveness or efficiency in crime control, that is to say, criminalistic work.

On the other hand, „strategic approach in the work of criminal police“, „strategic approaches within the criminal police“, „strategic approach to the work of criminal police“ include concepts (strategies) which are not focused (directly) on improving the efficiency and effectiveness in crime elimination, but on the improvement of e.g. humane working conditions within the police, which in turn has an indirect effect on the realization of criminalistic goals in a narrow sense.

Therefore, term „strategic action of criminal police“ offers more on theoretical and practical plane, as it entails criminalistic strategies, but also other strategic approaches and directions that have equal importance in the work of criminal police (reward system, increasing motivation, improvement of personnel selection and promotion in the service, professionalization of the service, etc.).

Apart from that, we should not give up on the term „criminalistic strategy“. It only needs to be defined more accurately (as far as this is possible) in relation to other strategic approaches that are being applied, i.e., that should be applied within criminal police. Term „criminalistic strategy“ should exist. It should be known to scientific, professional but wider public as well, since it suggests that crime can and should be dealt with from a strategic point of view, not only from operational and tactical level. On the other hand, strategic action, that is, improvement of crime control, can be accomplished not only with strategic action on the crime field by implementing strategic criminalistic projects (measures) in narrow sense of the word, but also by improving the working conditions for criminal police (increasing motivation; proper personnel selection; adapted trainings; defining systems for control, reward, penalties, promotions, etc.) Therefore, the term „strategic approach to the work of criminal police“ gives more space, as it covers a wide field of strategic action where criminalistic strategy is only one of the fields of strategic action within the criminal police.

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<sup>46</sup> Simonović, B.: Istraživanje stavova pripadnika kriminalističke policije MUP-a Republike Srbije o strateškom pristupu suzbijanja kriminala, op. cit.; Simonović, B.: *Kriminalistika*, op. cit.



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## PERCEPTIONS OF SECURITY ISSUES ON THE LOCAL LEVEL – COMPARISON OF SLOVENIAN POLICE OFFICERS' AND CITIZENS' VIEWS

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**Abstract:** Today most of the crime prevention efforts in Slovenia and throughout the Europe are directed toward partnership between various institutions on the local level. In order to set priorities in the field of local safety provision, crime prevention and crime control, police and other institutions need the data on nature and dynamics of security issues. Along with official statistic data local community inhabitants' views on these issues need to be taken into consideration. In this paper we examine Slovenian police officers (581) and local citizens' (961) perceptions of local security issues. Findings and policy implications will be discussed.

**Keywords:** local community, local safety provision, security issues, citizens, police officers

### INTRODUCTION

Changes in the international security environment and the redefinition of the concept of security they have fostered, pose new challenges to state and local authorities in Europe in the field of security provision. Additionally, recent economic crisis has brought on factors of uncertainty such as poverty and unemployment<sup>1</sup>.

Accordingly, the nature of policing and crime control has also changed fundamentally in many Western European countries over the last two decades. The police are no longer perceived as the only bearer of the responsibility for provision of safety; other public and private agencies are also perceived as important actors in the process of prevention and control of crime, disorder and insecurity<sup>2</sup>. These organisations, which might not have been primarily established for policing in a broader sense can be the following: the public prosecutor, the customs service, inspection services, intelligence-security services, services for the enforcement of criminal sanctions, local policing bodies, private security companies and private investigators<sup>3</sup>. Nowadays states govern indirectly by mobilizing the knowledge, capacity and resources of other institutions, groups and individuals in the provision of security and other goods<sup>4</sup>. The essence of the new crime prevention approach and also of the community policing is responsabilization strategy, which tends to extend the responsibility for governance of crime and safety to other non-state actors by linking state agencies up with local communities, citizens and businesses. Tasks that were formerly the monopoly of the police are now presented as the moral duty of other agencies and citizens, which is supported by moral and financial arguments<sup>5</sup>. This development seems to be a part of general change in many Western countries with a great number of state tasks being privatized or transferred to non-state agencies<sup>6</sup>.

As Gilling (1997) notes, from the end of the 1980s the community safety rested upon a dual strategy – combination of reason and ideology. The effort was focused at first on passing the responsibility down through the community to the individual resident and then followed by

1 B. Tominc and A. Sotlar, *The politics of peacekeeping: The case of Former Yugoslavia*, Ljubljana, 2011, p. 457-483.

G. Meško, B. Tominc and A. Sotlar, *European journal of criminology*, 2013, p. 284-296.

2 J. Terpstra, *Police Practice and Research: An International Journal*, 2008, p. 213-225.

3 A. Sotlar and G. Meško, *Varstvoslovje*, 2009, p. 269-285.

4 J. Wood and C. D. Shearing, *Imagining security*, Cullompton, 2007.

5 D. Garland, *The Culture of Control; Crime and Social Order in Contemporary Society*, Chicago, 2001. K. Franko Aas, *Globalization and Crime*, London, 2007. J. Terpstra, *Police Practice and Research: An International Journal*, 2008, p. 213-225.

6 J. Terpstra, *Police Practice and Research: An International Journal*, 2008, p. 213-225.

putting it in the context of multiagency structures, while the concept of partnership linked both. Franko Aas (2007) notes that local disorder issues are nowadays entwined with global transformations (as for instance transnational migration, global business, deindustrialization) and as a consequence local safety provision efforts have become search for local solutions to globally produced problems.

Council of Europe (2003) defines community safety as a situation in which people are free from real and perceived risks arising from crime and related misbehaviour; are able to cope with such risks in case they do experience them; or if they cannot cope it unaided, are protected from the consequences of these risks, so they can live a normal cultural and economic life. Community safety is concerned with serious crime as well as minor crimes and regulatory offences – different phenomena that diminish the quality of life. The focus mainly remains on the criminal other in public space, rather than on crime within the home or in the corporate sphere<sup>7</sup>.

Although national government holds the responsibility for setting up a legal basis for crime prevention as well as repression, it is at the local level where problems are actually most acutely felt and perceived<sup>8</sup> and can be therefore best tackled by finding “local solutions to local problems”<sup>9</sup>. Local governments are thus in the best position to understand citizens’ concerns, moreover, they are familiar with local community’s needs and strengths<sup>10</sup>. Public participation in local democracy is a two-way process that allows local self-government to respond to citizens’ needs or demands and to improve its services. With public participation, mutual trust could be developed and general quality of life could be increased<sup>11</sup>. Modern approaches rely upon partnerships which represent the new way to solve old problems and may be established between centre and locality; between the public and the private; and between criminal justice and social policy<sup>12</sup>. Factors that increase risk for crime-related problems at the local level are<sup>13</sup>:

- inadequate infrastructure along with inadequate fiscal and administrative powers,
- poor housing and neighbourhood conditions,
- lack of facilities such as good education and health services,
- high unemployment,
- easy access to drugs or small arms.

Therefore, in order to develop resilience to crime, communities should strive for improvement in neighbourhood services and facilities as well as for increasing social capital and providing opportunities for education and training<sup>14</sup>. Community safety incorporates situational and social crime prevention; crime and disorder reduction as well as fear and insecurity reduction; working with (potential and actual) victims and offenders. Non-governmental organizations can play an important role in provision of local safety. Because of their non-governmental status, they usually enjoy high level of trust among people, work closely with residents (victims, offenders, professionals, officials and media) and are perceived as service providers<sup>15</sup>.

Participation of civil society in preparation and implementation of local safety strategies has become a crucial aspect of effective safety policy at both local and national level of government in charge of crime prevention and security<sup>16</sup>. Close cooperation between the police and local community is also the principle element of community policing philosophy<sup>17</sup>, which Slovenia at the declarative level has been following after gaining its independence in 1991<sup>18</sup>. In order to set priorities in the field of local safety provision, crime prevention and crime control, police and

7 D. Gilling, *European Journal on Criminal Policy and Research*, 2001, p. 381–400.

8 Council of Europe, *Urban Crime prevention: a guide for local authorities*, Strasbourg, 2002.

9 D. Gilling, *European Journal on Criminal Policy and Research*, 2001, p. 385.

10 United Nations Office on Drugs and Crime, *Handbook on the Crime Prevention Guidelines Making them work*, 2010.

11 Government of the Republic of Slovenia, *About Slovenia*, 2012.

12 D. Gilling, *European Journal on Criminal Policy and Research*, 2001, p. 381–400.

13 United Nations Office on Drugs and Crime, *Handbook on the Crime Prevention Guidelines Making them work*, 2010.

14 United Nations Office on Drugs and Crime, *Handbook on the Crime Prevention Guidelines Making them work*, 2010.

15 United Nations Office on Drugs and Crime, *Handbook on the Crime Prevention Guidelines Making them work*, 2010.

16 J. Kulach, N. Whiskin and E. Marks, *Urban crime prevention policies in Europe: Towards a common culture?* Paris, 2006.

17 G. Meško, A. Bučar-Ručman, B. Tominc and D. Maver, *Policing in emerging democracies: Critical reflections*, 2007, p. 209–241.

18 G. Meško and G. Klemenčič, *Legitimacy and criminal justice*, 2007, p. 84–115.

other institutions need the data on nature and dynamics of security issues. Along with official statistic data local community inhabitants' views on these issues need to be taken into consideration. The police are perceived as the main actor in local safety provision in Slovenia<sup>19</sup>, which was confirmed also by results of the recent nationwide research on local safety provision<sup>20</sup>. This is the main reason why the present paper is focused particularly on police officers' and citizens' views, although local safety is supposed to be addressed by various formal and civil society institutions, joined within local safety councils<sup>21</sup>.

## PROVISION OF SAFETY ON THE LOCAL LEVEL IN SLOVENIA

Contemporary crime prevention and community safety trends in Slovenia have been characterized by the impact of Western societies' ideologies, especially by the concept of community responsabilisation and involvement of local administration in safety provision process<sup>22</sup>. Important element of the local safety policy in Slovenia are local safety councils, situated within local administration as a consultative body for crime and safety issues. Local safety councils are part of the strategy of community policing and represent an organized way of setting priorities for crime prevention and provision of safety at the local level<sup>23</sup>. Organisation and work of the police act<sup>24</sup> and Local Self-Government Act<sup>25</sup> provide legal basis for the establishment of such councils, however the establishment is not mandatory. Members of local safety councils are representatives of both public and private agencies – police officers, municipal wardens, mayors, members of municipal councils, local government civil servants, representatives of social service organizations, schools, local business, media, political parties and nongovernmental organizations<sup>26</sup>. Around one hundred and fifty-three<sup>27</sup> local safety councils have been established within municipalities in Slovenia. In most cases local safety councils were founded by mayors on the initiative of police<sup>28</sup>.

In 2003 and 2004 Meško and Lobnikar (2005) conducted a study, focused on functioning of local safety councils in Slovenia and advantages and obstacles related to their work. The authors also reflected on the councils within a broader concept of democratization and inclusion of citizens in crime prevention and partnership-oriented local problem solving. A sample consisted of 178 representatives of local safety councils in several Slovenian towns. For the purpose of the study authors organized presentations for representatives of local authorities, the police force, local community groups and non-governmental organizations in each of these towns. The respondents were presented with the documents (including the European Urban Charter<sup>29</sup> and Urban Crime Prevention Guide<sup>30</sup> and they discussed safety problems in local communities, identified the main local safety and crime prevention problems, and devised solutions to these problems. At the end of each session a questionnaire was administered to the respondents.

Research findings show that for local safety problems solving ad hoc approaches are used on the basis of a temporary partnership in which the police are the most active according to

19 G. Meško et al., *Policing in emerging democracies: Critical reflections*, 2007, p. 209–241.

20 G. Meško, A. Sotlar, B. Lobnikar, M. Jere and B. Tominc, *Občutek ogroženosti in vloga policije pri zagotavljanju varnosti na lokalni ravni: CRP (V5-1038 A): poročilo ciljnega raziskovalnega projekta [Feelings of insecurity and the role of police in local safety provision]*, Ljubljana, 2012.

21 *Zakon o lokalni samoupravi [Local Self-Government Act]*, *Uradni list Republike Slovenije*, 2007.

*Zakon o organiziranosti in delu v policiji [Act on police organization]*, *Uradni list Republike Slovenije*, 2013.

22 B. Lobnikar and G. Meško, *Police, policing, policy and the city in Europe*, Ljubljana, 2010, p. 161-179.

23 G. Meško, *Revija za kriminalistiko in kriminologijo*, 2004, p. 258-265.

G. Meško and B. Lobnikar, *Policing: An international journal of police strategies & management*, 2010, p. 353-373.

G. Meško, M. Nalla and A. Sotlar, *Quality in crime prevention*, 2006, p. 133-143.

24 *Zakon o organiziranosti in delu v policiji [Act on police organization]*, *Uradni list Republike Slovenije*, 2013.

25 *Zakon o lokalni samoupravi [Local Self-Government Act]*, *Uradni list Republike Slovenije*, 2007.

26 G. Meško, *Urban safety: problems, governance and strategies*, Enschede, 2004, p. 133-144.

G. Meško and B. Lobnikar, *Policing: An international journal of police strategies & management*, 2005, p. 353-373.

27 Data as of May 2010 (www.policija.si).

28 G. Meško, M. Nalla and A. Sotlar, *Quality in crime prevention*, 2006, p. 133-143.

29 Council of Europe, *The European Urban Charter*, 1992.

30 Council of Europe, *Urban Crime prevention: a guide for local authorities*, Strasbourg, 2002.



more than a half of the respondents. More than 80 percent (53 police officers and 89 other respondents) of respondents opine that the police perform well and the local administration should cooperate more closely in solving local safety problems and crime prevention. According to respondents, the police bear greatest responsibility for local crime control and safety problems, followed by the local city administration, individuals, schools, social services and family. Social crime prevention measures are recognized as necessary priorities, while the least appropriate preventive measures seem to be citizen's patrols, private security at schools, police repression – strict law enforcement, designing out crime, private security, situational crime prevention and personal and property insurance.

Respondents suggest that better policing in their communities is related to more police officers on the beat in local communities, greater visibility and approachability of police officers, better co-operation and communication between the police and local citizens as well as adequate police training in communication skills, and social and cultural diversity. Respondents believe it is necessary to pay more attention to professional policing, developing skills for problems solving, stimulating sense of belonging to the community, and solving social problems<sup>31</sup>.

In study, conducted in 2003<sup>32</sup> police station commanders estimated that police have adequate legal grounding for work in safety councils and that commanders themselves are also involved in the setting up of safety councils, but they feel there is too little support from local communities for work in safety councils.

Under the auspices of Ministry of the Interior in 2010 analysis of safety councils members' perspectives on different aspects of cooperation between local community, police and municipal warden service was conducted (Ministrstvo za notranje zadeve, 2010). At that time safety councils were established in 126 municipalities and 46 of them responded. Safety council members were asked who provides safety and in their opinion these are police (100 percent), municipal warden service (68 percent) and private security companies (44 percent). Two thirds of respondents (66 percent) are satisfied with police – citizen cooperation as well as with police – local administration cooperation (72 percent). Police relations with citizens are generally very well appraised – seventy-six percent of respondents are satisfied with them, while eight percent are unsatisfied. Vast majority of the respondents believe that safety councils contribute to the higher level of safety in the community.

In 2012 a study on urban security management in the capitals of the former Yugoslav republics was conducted<sup>33</sup>. Semi-structured interviews with municipal security experts and officials as well as university researchers who deal with security issues in Ljubljana (Slovenia), Zagreb (Croatia), Sarajevo (Bosnia and Herzegovina), Belgrade (Serbia) and Skopje (FYR Macedonia) were used as a method.

Experts and researchers suggested the following approaches to community safety management: preventing the onset of offending behaviour and incivility, enforcing the criminal law, enhancing the democratic scrutiny and oversight of security strategies, and reducing social inequalities in household income, access to education, employment, healthcare and housing. The interviewees believe that security strategies should be coordinated by local authorities and higher financial support should be provided by the state government. They all agreed that the entities of formal and informal (victims support associations, sports associations, non-governmental organizations) social control on the state and local level, should strive to jointly secure their local community.

The results of recent research<sup>34</sup> among Slovenian citizens and police officers on various aspects of local safety provision show that in respondents' opinion the most serious safety problems in local community are factors of insecurity (unemployment, poverty, economic decline), illegal drugs and alcohol, organized crime and traffic safety issues. Respondents expect fire fighters, the police and citizens themselves to contribute the most to local safety. In contrast to

31 G. Meško and B. Lobnikar, *Policing: An international journal of police strategies & management*, 2005, p. 353-373.

32 F. Kosmač and V. Gorenak, *V slovenski dnevi varstvoslovja*, Ljubljana, 2005, p. 714-726.

33 G. Meško, B. Tominc and A. Sotlar, *European journal of criminology*, 2013, p. 284-296.

34 G. Meško, A. Sotlar, B. Lobnikar, M. Jere and B. Tominc, *Občutek ogroženosti in vloga policije pri zagotavljanju varnosti na lokalni ravni: CRP (V5-1038 A): poročilo ciljnega raziskovalnega projekta [Feelings of insecurity and the role of police in local safety provision]*, Ljubljana, 2012.

previous research, these findings indicate that the responsibility for local safety provision is no longer perceived by the public as the sole monopoly of the police.

Today most of the crime prevention efforts in Slovenia are directed toward partnership between various institutions on the local level. According to Meško and Lobnikar (2005) efforts for local safety are still at an early stage in Slovenia. They see main obstacles in undefined role of local municipalities in the process of local safety provision, problems of centralized local institutions and consequently problems of the financing activities on the local level. Recent research on local safety provision showed that one of the main problems is the lack of a common database for the creation of strategies and action plans. Instead of knowledge- and evidence-based approaches, crime prevention activities are often directed by action, despite the warnings that action without knowledge can even worsen the situation<sup>35</sup>.

### LEGISLATIVE AND POLICY FRAMEWORK

Organisation and work of the police act<sup>36</sup> recommends the cooperation of police with local community in the areas related to crime prevention and other local security issues. Councils, committees, commissions or other similar forms of cooperation are established for the purposes of cooperation. Local Self-government act<sup>37</sup> also allows the establishment of councils and committees as working bodies of municipal council. However both provisions are more or less recommendatory.

Article 21 of the Local Self-government act<sup>38</sup> defines the tasks municipality performs to meet the needs of its residents. Among other tasks it is also responsible for the following:

- environmental protection (protection of air, soil, water; collection and disposal of waste; protection from noise pollution)
- legal regulation of the road traffic in the municipality
- municipality warden service
- control over local events
- maintaining order in municipality
- fire safety and rescue assistance
- assistance and rescue in case of natural and other disasters
- defining minor offenses and penalties for minor offenses which violate the municipality regulations.

Act on Local Police<sup>39</sup> requires yearly security plans coordinated between police and local community. Upon the proposal of mayor, the municipal council adopts municipal security program, based upon assessment of the security situation in the municipality. Purpose of the municipal security program is to systematically provide the quality of public space, which includes residents' satisfaction with their living and working environment as well as to establish partnership between police and municipal warden service in local safety provision<sup>40</sup>. The mayor and the head of the police organizational unit, responsible for the area of municipality, are in charge for regular cooperation between municipal warden service and the police<sup>41</sup>. Municipal warden service is responsible for public safety and public order. Within its authority it monitors and regulates road traffic in the municipality, it maintains safety on municipal public roads as well as on recreational and other public areas. They are tasked with protection of public property, natural and cultural heritage.

Policy guidelines for crime prevention in Slovenia are represented in Resolution of the National Plan on Preventing and Combating Crime for the period of 2012-2016<sup>42</sup>. It stresses the

35 G. Meško and A. Sotlar, *Revija za kriminalistiko in kriminologijo*, 2012, p. 229-239.

36 *Zakon o organiziranosti in delu v policiji [Act on police organization]*, *Uradni list Republike Slovenije*, 2013.

37 *Zakon o lokalni samoupravi [Local Self-Government Act]*, *Uradni list Republike Slovenije*, 2007.

38 *Zakon o lokalni samoupravi [Local Self-Government Act]*, *Uradni list Republike Slovenije*, 2007.

39 *Zakon o občinskem redarstvu [Act on local police]*, *Uradni list Republike Slovenije*, 2006.

40 Š. Gostič, *8. slovenski dnevi varstvoslovja*, Ljubljana, 2007.

41 *Zakon o občinskem redarstvu [Act on local police]*, *Uradni list Republike Slovenije*, 2006.

42 *Resolucija o nacionalnem programu preprečevanja in zatiranja kriminalitete za obdobje 2012 – 2016 [Resolution of the National Plan on Preventing and Combatting Crime for the period of 2012-2016]*, *Uradni list Republike Slovenije*, 2012.

importance of systematic and co-ordinated implementation of all those activities performed by governmental institutions, civil society and citizens that can in any way contribute to crime prevention and control<sup>43</sup>. Fundamental goal of the Resolution is constant and long-term provision of safety for people in the Republic of Slovenia and consequently to ensure that people feel safe. One of the general objectives is to improve cooperation between law enforcement authorities, criminal justice authorities, state authorities, local communities, research organizations and nongovernmental organizations<sup>44</sup>.

Another important policy document in the field of safety provision is Resolution on National Security Strategy of the Republic of Slovenia<sup>45</sup>. Within the system of interior safety the document identifies main actors in the process of safety provision (institutions of public safety, police, the public prosecutor, inspection and supervisory bodies, security and intelligence services, private law organizations, local self-government bodies) and emphasizes their cooperation with other civil organizations, associations and initiatives, local communities as well as building public-private partnerships.

## METHOD

### Survey construction

Survey is part of the nationwide research *Feelings of safety and the role of police in local security provision*<sup>46</sup> conducted by the Faculty of Criminal Justice and Security, University of Maribor<sup>47</sup>. For the purposes of this research two questionnaires were designed; one for police officers and one for citizens. Both questionnaires were constructed to ask several questions about attitudes toward various aspects of local safety provision and these questions are the same for both police officers and citizens. One part of both questionnaires includes questions regarding perceived security issues in the local community. Respondents were given a list of 69 possible security issues and they were asked to express their perceptions of those issues on a 5-point Likert scale, ranging from "Not an issue at all" (1) to "Serious issue" (5). They were specifically asked to focus on the situation in their local community (municipality). In the last part, both questionnaires contained questions on demographics.

### Data collection

To measure police officers' and citizens' attitudes, two surveys were conducted in the period between November 2011 and January 2012 – one among police officers and one among citizens. Before filling out the survey, all respondents were informed that their participation was voluntary and that the information they provided was completely anonymous.

To conduct survey among police officers we asked each selected police station commander to arrange a meeting with police officers at their police station where they would fill in the questionnaire after our basic explanation and instructions. It was then agreed to conduct survey among police officers during their regular working meetings in order to ensure their presence and avoid time pressure they might experience when completing the questionnaire.

Questionnaires for citizens were administered among random residents of selected municipalities. After our basic explanation and instructions, questionnaires were left with the respondents for some time (from few hours up to one day) and then picked up as previously agreed with each respondent.

### Sample

Sample of citizens comprises Slovenian residents aged 18 and over, and a random sample of police officers was drawn from the population of all Slovenian police officers. Strata are defined by the areas of (8) police departments and by the municipality type (one small, one medium and one large municipality), meaning that the sample comprises police officers from 24 police sta-

43 D. Anželj, *Zbornik prispevkov, 12. slovenski dnevi varstvoslovja*, Ljubljana, 2011.

44 Government of the Republic of Slovenia, *About Slovenia*, 2012.

45 Resolucija o strategiji nacionalne varnosti Republike Slovenije [Resolution on National Security Strategy of the Republic of Slovenia], *Uradni list Republike Slovenije*, 2010.

46 The research was funded by Slovenian Research Agency and Ministry of Interior within the Target research programmes »CRP – Slovenian Competitiveness 2006-2013«.

47 G. Meško, A. Sotlar, B. Lobnikar, M. Jere and B. Tominc, *Občutek ogroženosti in vloga policije pri zagotavljanju varnosti na lokalni ravni: CRP (V5-1038 A): poročilo ciljnega raziskovalnega projekta [Feelings of insecurity and the role of police in local safety provision]*, Ljubljana, 2012

tions and residents of 24 Slovenian municipalities, which are under the jurisdiction of individual police station. Within selected municipalities 1200 questionnaires were administered and selected police stations employ 1216 police officers. Nine hundred and fifty-nine citizens completed the questionnaire, representing 80 percent response rate and five hundred and eighty-one police officers returned completed questionnaires, representing 48 percent response rate. Overall, 1540 useable questionnaires were received from both groups of respondents, representing 64 percent response rate. The respondents' socio-demographic characteristics are presented in Table 1.

The proportions of police officers regarding gender, education and age match the structure of Slovenian police organization – there are 14.6 percent of female police officers in our sample, the majority of respondents (almost three quarters) have finished high school and one quarter have more than a high school education, a half of respondents report their monthly income is much or partly lower than average monthly income in Slovenia and one third of them report it is approximately equal. Three quarters of the respondents is between 21 and 40 years old. Socio-demographic characteristics of citizens approximately match the census of Slovenian residents – about half of respondents are female, more than a half have finished high school, one third have more than a high school education, a half of respondents report their monthly income is much or partly lower than average monthly income in Slovenia, while a little less than one third report it is partly or much higher. Sixty percent of respondents are between 21 and 50 years old.

Variable	Value	Police (%) (N = 581)	Citizens (%) (N = 959)
Gender	1 Male	85.4	45.3
	2 Female	14.6	54.7
Education	1 Unfinished elementary school	0.2	0.4
	2 Finished elementary school	0.3	9.7
	3 Finished high school	72.6	54.2
	4 Higher vocational education	8.7	10.0
	5 First cycle professional and academic education	16.7	24.1
	6 Second and third cycle (Master and Doctor of Science)	1.6	1.6
Monthly Income	1 Much lower	25.3	21.0
	2 Partly lower income	25.5	27.3
	3 Approximately equal	32.6	18.3
	4 Partly higher	12.1	17.5
	5 Much higher	1.2	13.3
	6 do not want to answer	3.3	2.7
Age	1 20 years and younger	0.0	10.6
	2 21–30	35.0	28.3
	3 31–40	41.3	15.3
	4 41–50	22.0	18.6

	5 51–60	1.8	13.7
	6 61–70	0.0	8.3
	7 71–80	0.0	4.6
	8 81 years and older	0.0	0.6
Length of residency	1 5 years or less	/	6.6
	2 6–15 years	/	10.0
	3 16–25 years	/	29.9
	4 26–35 years	/	21.3
	5 36–45 years	/	13.4
	6 46 years or more	/	18.9

Table 1: General characteristics of respondents (Police Officers and Citizens)

#### Analytic strategy

Study is based on quantitative methodology and analyses were supported by SPSS 21.0 software. Since the sample contained a large number of units we first performed factor analysis to reduce the number of variables. A principal component analysis (PCA) was conducted on selected items with orthogonal rotation (varimax). The Kaiser–Meyer–Olkin (KMO) measure was used for the sampling adequacy for the analysis and Bartlett’s test of sphericity was used to indicate whether the correlations between items were sufficiently large for PCA. Reliability analysis was used to measure the consistency of a questionnaire by running separate reliability analyses for all subscales of the questionnaire (considering the value of Cronbach’s alpha).

As we are focusing on the comparison between police officers’ and citizens’ views, we performed t-test to compare the actual difference between both groups’ means in relation to the variation in the data.

## RESULTS

Factor analysis<sup>48</sup> provided the set of eleven scales which are presented in Table 2 along with scale means and standard deviations. T-test results are presented in Table 2 and further analyzed in the text, with the emphasis on most similar and most dissimilar views of police officers and citizens.

Scale	1 Police officers		2 Citizens		t-value
	$\bar{x}$	$\sigma$	$\bar{x}$	$\sigma$	
Threats to life, limb and sexual integrity	2.74	0.79	2.47	0.88	6.12*
Threats to property	3.06	0.83	2.71	0.89	7.72*
Threats to traffic safety	3.08	0.90	2.99	0.94	1.86
Threats to environment and natural resources	2.50	0.73	2.64	0.82	-3.45*
Natural and other disasters	2.34	0.84	2.45	0.83	-2.43*

<sup>48</sup> For description of the factor analysis and items which comprise individual scale see Meško, Sotlar, Lobnikar, Jere, & Tominc (2012).

Organized crime	3.45	0.81	3.10	0.96	7.65*
Migration	2.66	0.87	2.15	0.89	10.79*
Physical and social disorder	2.84	0.78	2.66	0.80	4.40*
Drugs and alcohol	3.34	0.83	3.22	0.93	2.69*
Factors of uncertainty	3.74	0.87	3.59	0.93	3.03*
Marginalized groups	2.31	0.86	2.06	0.88	5.56*

1= Not an issue at all; 5= Serious issue

\*  $p < 0.05$ , 2-tail probability

*Table 2: Comparison of police officers' and citizens' views on local security issues*

To compare overall attitudes of both groups, t-tests were conducted for all scales. T-values indicate how both groups' views differ and show the size of existent differences. As it is evident from Table 2, the largest differences are found in views regarding migration as a security issue ( $t = 10.79$ ), followed by views regarding threats to property ( $t = 7.72$ ), views regarding organized crime ( $t = 7.65$ ), views regarding threats to life, limb and sexual integrity ( $t = 6.12$ ), views regarding marginalized groups ( $t = 5.56$ ), views regarding physical and social disorder ( $t = 4.40$ ), views regarding threats to environment and natural resources ( $t = -3.45$ ), views regarding factors of uncertainty ( $t = 3.03$ ), views regarding drugs and alcohol ( $t = 2.69$ ), and views regarding natural and other disasters ( $t = -2.43$ ).

Citizens and police officers hold similar views only regarding the seriousness of threats to traffic safety.

Results of T-tests indicate that there are statistically significant differences between views of citizens and police officers regarding ten out of eleven scales, with police officers mostly perceiving security threats as more serious than citizens. Threats to environment and natural resources as well as natural and other disasters are the only two groups of security issues perceived as more serious by citizens than by police officers.

The largest statistical difference ( $t = 10.79$ ) was observed in relation to the migrations, with police officers perceiving this possible security issue as much more serious compared to citizens.

Respondents perceive the following security issues as the most threatening: factors of uncertainty, intoxicating substances, organized crime and threats to traffic safety.

## CONCLUSION

Today most of the crime prevention efforts in Slovenia are directed toward partnership between various institutions on the local level – the trend that is present throughout the Europe and along with active participation in local level decision-making, integration and social inclusion of all members of the society represents the *file rouge* of the most of the documents adopted by European community concerning safety provision. Citizen participation in local democracy should encompass voluntary and active participation, fair and democratic participatory process and the ability to impact the final decisions<sup>49</sup>. Without redistribution of power “citizen participation can become an empty and frustrating process for the powerless”<sup>50</sup>.

Meško and Sotlar (2012) found that one of the main problems of local safety efforts in Slovenia is the lack of knowledge- and evidence-based approaches. Instead, crime prevention activities are often directed by action. In relation to the latter, we can also talk about public opinion-led policy making, a new phenomenon, which is leading to the exclusion of criminological

49 B. A. Buren, *Evaluating citizen oversight of police*, New York, 2007.

50 S. R. Arnstein, *Journal of the American Institute of Planners*, 1969, p. 216.



expertise from crucial crime prevention issues<sup>51</sup>. One of the steps necessary for setting priorities in the field of local safety provision, crime prevention and crime control is reliable database on nature and dynamics of security issues. This paper presents a modest attempt at establishing such a database by offering the insight in the police officers' and citizens' views regarding local security threats. After comparing both groups' views on various possible security issues it was found that police officers and citizens disagree regarding ten out of eleven groups of possible security treats, with police officers mostly perceiving security threats as more serious than citizens. However, they hold similar views regarding the seriousness of threats to traffic safety. Further research should be directed to factors which may influence citizens' and police officers' views on local security. Once identified, these factors might help overcoming the existent challenges in the field of local safety provision in Slovenia: to establish cooperation between various actors or where it already exists, turn it into partnership<sup>52</sup>, as well as to encourage citizen participation in local democracy processes.

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## PRINCIPLES OF TAXATION<sup>1</sup>

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**Abstract:** The paper points to the need for respecting certain principles defined by the modern science of taxes when creating and implementing the tax system and tax policy. Regardless of the place taxes will take in the structure of public revenues of the state, the tax system must adhere to certain principles. Tax principles should enable the fulfilment of certain objectives of tax policy set in a given time. The content of tax principles must be constantly checked in practice. In this paper we did not observe socio-political, legal and administrative tax principles, but only financial and economic.

**Keywords:** tax, taxation principles, tax burden, tax source, final taxpayer.

### INTRODUCTION

Taxation is a complex category, since it contains economic, financial, social, political, and other elements. By studying justification of taxation and purposes of taxation, one can see for which purposes funds raised through taxes are used, and in what ways it's being justified. In this regard, there are certain principles of taxation whose task is to set before the tax authorities and the tax system, certain requirements relating to the provision of financial resources to finance public expenditures. Depending on the extent to which the tax authorities adhere to these principles, it can be concluded that the tax system is or isn't good.

The content of tax principles must constantly check in practice. Only in that way the conditions are created in which tax theory affects tax policy. Tax policy is shaped under the influence of different conditions, among which scientific principles of taxation do not necessarily have the lead. Therefore, the principle of taxation should not be set abstractly, outside the given social environment. Theory should shape the contents of these tax principles by taking into account the conditions in a given society. Proclaimed principles of taxation should be seen as an ideal that should be achieved. However, this ideal cannot be fully reached. Tax policy should be conceived so that a whole set of requirements set in tax principles are as fully as possible achieved, but it must be clear that some exceptions must be made<sup>2</sup>.

A German tax author, Adolf Wagner, formulated and systematized taxation principles in late XIX century. He grouped tax principles into four categories, namely: a) the financial tax principles, which consisted of abundance and elasticity, b) economic principles, which included the proper selection of tax resources and taking into account the effects of certain taxes, c) social principles, which included the generality and equity and d) financial and technical principles, which included the legality, convenience and low costs of taxation<sup>3</sup>.

The tax theory upgraded the listed Wagner's tax principles, and modern tax systems are based on the following tax principles: 1) financial, 2) economic, 3) socio-political and 4) legal and administrative. This paper will not address all tax principles, but only financial and economic.

<sup>1</sup> This paper was written under the scientific research project *Development of Institutional Capacities, Standards and Procedures for Fighting Organized Crime and Terrorism in International Integration Climate*. The project is funded by the Ministry of Education and Science of the Republic of Serbia, project No. 179045.

<sup>2</sup> D. Popović, *Nauka o porezima i poresko pravo*, Open Society Institut/Constitutional and Legislative Policy Institute, Budapest and Savremena administracija, Belgrade, 1997, pp. 270-271.

<sup>3</sup> A. Perić, *Finansijska teorija i politika*, Savremena administracija and Institut za ekonomska istraživanja, Belgrade, 1971, p. 236.

## 2. Financial Tax Principles

In practice, taxes are primarily seen as instruments for providing the necessary budget revenues, although they are also used for achieving other goals – economic and socio-political. Therefore, financial principles have priority over the other principles. According to these principles, taxes should be abundant to the extent that they cover all public expenditures. These principles require tax to be mobile, or to be able to quickly adapt to the changes in order to establish a balanced budget<sup>4</sup>. In other words, this means that taxes should be such that they can provide optional increase or decrease of the income deriving from it. In this sense, these principles have priority over other tax principles. However, when pursuing tax policy, one must also take into account other tax principles, that is, one should make compromises, which will, to a certain extent, satisfy all the principles.

The group of these principles includes: 1) the principle of abundance, and 2) the principle of elasticity.

### 2.1. The Principle of Abundance

The tax system should be abundant, i.e. it should provide enough revenue to cover the public needs. A state needs such a tax system that would orderly and non-inflationary provide sufficient funds to cover all regular public expenditures, as well as a smaller or larger amount of funds to cover certain extraordinary expenditures. In a narrow sense, this principle has priority over other principles, and therefore it has to be fully satisfied, even at the expense of other tax principles. In a broader sense, the principle of abundance does not have the absolute priority over other principles, and therefore other tax principles should also be respected when designing tax policy.

### 2.2. The Principle of Elasticity

The principle of elasticity implies that taxes should quickly and fully adapt to changes in the amount of public expenditures. It is a variant of the principle of abundance, which is not reduced to the fiscal year as the unit of observation, but also takes into account the constant maintenance of a balanced budget. This principle requires that the tax system, as a whole, provides higher or lower total amount of public revenue. Since there is a tendency where government expenditures are rising faster than the national income, the tax system should be elastic, i.e. it should ensure that tax revenues are growing faster than the national income, without introducing new taxes that for this purpose and without increasing the tax rates. In order to achieve such elasticity of the tax system, the tax authorities should tax sectors that have high growth rates, apply progressive tax rates, tax consumption that has a high stability of demand, etc.

Elasticity of the taxes is particularly important in terms of economic growth. Economic growth requires high public investment in economic infrastructure. Growth in tax revenue provides that such investments are not financed from foreign sources or domestic debt. In addition, the increase in tax revenue reduces the need to increase the tax rates whose increase adversely affects the overall investment climate.

In recession, which leads to a reduction of fiscal capacity, certain public expenditures are not necessary decreased. Thus, for example, when due to the recession the profit of the corporations and individual income are decreased, expenditures for financing the defence and security of the country are not reduced, and the reduced revenue from corporate income tax and personal income tax must be compensated through the collection of other taxes, which better adapt to trends in public expenditure, that is, are less responsive to negative trends in the economy. This is called financial elasticity, which includes the feature of a tax to adapt to changes in public expenditure, that is, it is a low level of sensitivity to the economic conjuncture. The value added tax and excise tax on certain products (tobacco, alcohol), as well as property taxes, meet the criterion of financial elasticity. If taxpayer's income declines, his/her consumption of cigarettes and alcoholic beverages will not decrease, or will decrease very little, because a taxpayer will hardly let go of his/her habits.

Financial elasticity can be: 1) economic and 2) legal. If tax revenues grow and automatically follow the growth of public expenditures, then we have economic elasticity, when the state does not need to change the tax rates. This can be seen in the example of the value added tax, because as the taxpayer's consumption increases, so do tax revenues, while the tax rate remains

<sup>4</sup> G. Milošević, *Evazija poreza*, Nauka – bezbednost - policija, Kriminalističko-policijska akademija, Belgrade, glavni i odgovorni urednik prof. dr Đorđe Đorđević, No. 2/2006. p. 62.

the same. If it is needed to increase the tax rate by changes in tax regulations in order to increase tax revenues, then we have legal elasticity. Property tax has this feature<sup>5</sup>.

### 3. Economic Tax Principles

Taxation causes different effects of microeconomic and macroeconomic nature. On the one hand, any tax directly reduces the economic strength of a taxpayer and therefore changes the modalities of his/her behaviour in the economy. The effects of one tax are spreading through the market and thereby trigger a chain of changes in the behaviour of producers and consumers, that is, in all sectors of the economy, and not only in directly taxed ones.

D. Popović classifies diverse economic tax principles into six groups: the principle of efficiency, the principle of selection of tax sources, the principle of moderate tax burden, the principle of flexibility, the principle of stability of the tax system, and the principle of the identity of the final taxpayer and the holder of the tax burden.<sup>6</sup>

#### 3.1. The Principle of Efficiency

The principle of efficiency means that the taxes should be set out in such way that they have the least possible impact on the economic decisions of economic entities in the market. Every tax necessarily affects the modalities of behaviour of economic entities and disturbs the location of production resources. That is why it is necessary to establish such a tax structure that will provide a given level of the tax revenue with the minimum losses in the social community.

#### 3.2. The Principle of Moderate Tax Burden

The principle of moderate tax burden in its original sense dictates that taxes should not be too high, because even when they are paid from income, or revenue as a tax source, and not from the property, they will adversely affect the taxpayer's willingness to work and thus develop economic activities.

Observed at the macro level, the principle of moderate tax burden includes determination of the absolute tax limit, or such level of tax burden of social product where further increase in tax rates or introduction of new taxes could not increase tax revenue of the country. The so-called Laffer curve explains the concept of absolute tax limit.

Laffer curve gives one practical conclusion: the state can achieve the same tax revenue (A) through two tax rates – one higher (D) and one lower (B).<sup>7</sup>

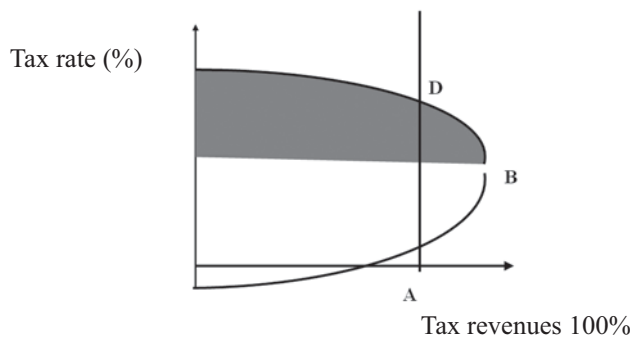


Figure 1: Laffer curve

The specific level of tax limit must be established for each country and each specific time. It is conditioned by many factors, and in developed countries it certainly is at a higher level than in underdeveloped. Holders of tax policy must ensure that the tax burden is moderate, because otherwise the tax policy would come into conflict with the ability of the economy, but also with the problem of moving of the capital.

<sup>5</sup> D. Popović, *op. cit.*, p. 274.

<sup>6</sup> D. Popović, *op. cit.*, p. 276.

<sup>7</sup> D. Popović, *op. cit.*, p. 276.



### 3.3. The Principle of Selection of Tax Source

The principle of selection of tax sources points to the importance of the source from which tax liability is settled. Economic tax principle dictates that, as a rule, only those sources that are continually renewed can be taxed, and not the property, which represent the unspent income from earlier periods. If the tax payments were made from the property, that would lead to its reduction, but taxpayer would also lose motivation to work and save.<sup>8</sup> However, this does not mean that in certain emergency situations, such as war, the state cannot reach out to collect taxes from the property in order to provide the missing income. Truth is that property taxation may also occur in ordinary circumstances, such as a tax on inheritance and gifts, etc. However, this is not a case of paying taxes from the existing assets of the taxpayer, which in this case increase. However, the increase as a consequence of taxation will be lower than it would've been if the tax was not filed.

### 3.4. The Principle of Flexibility

In regard to the principle of flexibility, one should distinguish the flexible and inflexible taxes. Flexible are those taxes whose revenues are automatically adjusted to the cyclic movement of national income. In contrast, for some taxes, it is necessary in change the tax rate the legislative process in order to adjust the amount of tax revenues with the changed economic circumstances. Such taxes would be inflexible.

### 3.5. The Principle of Stability of the Tax System

The principle of stability of the tax system states that taxes should not be frequently changed, as every radical change in methods of taxation disrupts economic conditions and causes shocks in which taxpayers are losing energy to adapt to new circumstances. The business world wants stable tax regime, because only in that way they can plan their business future.

### 3.6. The Principle of Identity of the Final Taxpayer and the Holder of the Tax Burden

In order to lead effective interest policy, it is necessary to know the effects of taxes, in order to achieve the identity of the final taxpayer and the holder of the tax burden. In some taxes, there is legislator's intent to shift the tax burden from taxpayer to another person – the final taxpayer. This is the case with sales tax, which includes economic strength of the buyer, and not of the legal taxpayer – the seller. D. Popović defines final taxpayer as a person who by legislator's intention is invited to bear the tax burden, that is, whose economic strength it should decrease. This may be the taxpayer, or another person.<sup>9</sup>

## 4. Socio-Political Tax Principles

The socio-political tax principles appear in two forms: as a principle of generality and as a principle of equity in taxation. In the financial literature, and in the public opinion, widespread is the understanding that taxes should be fair. However, perceptions of fairness are different. In the most general sense, one can say that fair taxation is those that is widely and evenly distributed to all taxpayers<sup>10</sup>.

### 4.1. The Principle of Generality

The principle of generality means that all persons must participate in the payment of public dues. Generality arises from the presence of a certain crucial fact (residency, citizenship) and, as a rule, means that all persons who are residents of a certain state are obliged to pay tax on their world income or world property, while non-residents are required to pay tax on income earned, or property they possess on its territory.<sup>11</sup>

Nowadays, the generality of the tax is implied, therefore some contemporary authors do not mention it as a formal requirement.

### 4.2. The Principle of Equity

The principle of equity provides a material precondition for fair taxation. The tax system is fair if every taxpayer pays the tax in proportion to the benefits they receive from public services. Another concept indicates that the fair tax system is the one in which every taxpayer participates

<sup>8</sup> G. Milošević, *Teorija i praksa finansijskog prava*, Belgrade, 2011, p. 107.

<sup>9</sup> D. Popović, *op. cit.*, pp. 82-83.

<sup>10</sup> G. Milošević, *op. cit.*, p. 109.

<sup>11</sup> D. Popović, *op. cit.*, p. 292.

in proportion to their economic strength in a given amount of public revenue. Persons with the same economic power should pay the same taxes, while individuals with greater economic power should pay higher tax than people with less economic power.

## 5. The Legal and Administrative Tax Principles

The legal and administrative tax principles include: the principle of legitimacy, the principle of minimizing administrative costs and the principle of minimizing the cost of paying taxes.

### 5.1. The Principle of Legitimacy

The principle of legitimacy means that the taxation can only be performed on the basis of the law. This principle has been well known for centuries. In modern countries, this principle was raised to the level of constitutional principles. Thus, the Constitution of the Republic of Serbia states that “everyone ... shall pay taxes and other duties prescribed by law”. The principle of legitimacy also has a legal meaning, which is reflected in respecting the following five requirements:<sup>12</sup> (1) only the law can be a source of tax legislation, (2) the tax rules can only be interpreted on the basis of legal text, (3) analogy can be applied in the tax law only if it acts within the limits of the law, (4) retroactive effect of tax laws is not allowed, and (5) the tax law should be clear and precise.

(1) Only the law can be a source of tax legislation. This requirement indicates that the entire tax law is reserved for legal regulation. However, not all tax regulations can be reduced to the imposition of the obligation to pay certain obligations to the state. The content of tax regulations may be different, and they can be passed by other government agencies, which under certain conditions doesn't have to be in conflict with the principle of legitimacy. Thus, we have several of tax by-laws, such as decisions by the Assembly, decrees issued by the government and regulations passed by the state administration bodies.

(2) The interpretation of the tax law represents determining of its meaning. In legal tax literature we find different approaches to the interpretation of tax regulations. We believe that those theorists who believe that the tax laws are of the same nature as other laws that make the legal system, and that the same criteria of interpretation of the general legal theory formulated for all laws should be applied on them, are right. Any interpretation which leads to distortion of the meaning of the law is unauthorized. The text of the tax law is the limit for the interpretation, in the sense that it must not lead to the position that would be contrary to what the words written in tax law mean.<sup>13</sup> This is a logical thought-operation which aims to find the true meaning of the law, to determine the content, scope and significance of the tax and legal norms, at any given moment, at the time of application of the law. This is a logical thought process which aims to find the true meaning of the law, to determine the content, scope and significance of the legal tax norms, at any given moment, at the time of implementation of the law.

(3) The analogy consists of expanding the legal norm to the cases that are not contained in it, but fall under the same meaning of the law that inspired that legal norm. However, it should be emphasized that a new law should not be created, but only the latent legal expression of the regulation indirectly contained in the law should be discovered. The real problem of analogy lies in determining what and of which kind the similarity between the two cases should be, in order to be able to apply the analogue. An analogy can be applied only if it acts within the limits of the tax law.

(4) Legal security and certainty require that laws and regulations be effective only in future, therefore, they don't have retroactive (backward) effect. Notwithstanding, some provisions of the law are allowed to have retroactive effect, if required by the public interest established in the legislative process. Cases of retroactive application of certain legal provisions are not rare in tax matters.

(5) Tax law must be clear and precise. This means that the legal description of the factual tax state is to be made in a clear and unambiguous manner. Content and limits of tax regulations must be clearly visible from the very text of the law.<sup>14</sup>

### 5.2. The Principle of Minimizing Administrative Costs

The principle of minimizing administrative costs means that the administrative costs of taxation should be as low as possible. The administrative costs of taxation cannot be avoided, be-

<sup>12</sup> G. Milošević, *op. cit.*, p. 110.

<sup>13</sup> D. Popović, *op. cit.*, p. 301.

<sup>14</sup> D. Popović, *op. cit.*, p. 320.

cause the tax procedure involves hiring personnel and appropriate equipment, as well as some material costs. If the difference between the gross tax collection and net tax collection is small, then the objectives for which the tax was introduced will be better met. However, if the administrative costs of taxation are higher, the more likely is that deficit will appear in the budget which will have to be covered either by increasing existing or introducing new taxes or, by reducing public expenditure. Administrative costs can be reduced by taking internal and external measures. Internal measures include actions aimed at improving the organization of tax administration, staff training and computerization. External measures are based on empirically proven conclusion that with the growing complexity of tax regulations, administrative expenses are increasing.

### 5.3. The Principle of Minimizing the Cost of Tax-Paying

The principle of minimizing the cost of paying taxes means that expenses to which tax debtors are exposed when fulfilling tax obligations should be minimal. This principle is, in fact, the other side of the principle of minimize administrative costs. The costs of the tax debtor may be direct or indirect. Direct costs are those that directly reduce the income of a tax debtor when settling tax obligations. They include charges a tax debtor pays to a tax advisor or accountant who keeps their books, the banking commission in payment of taxes, and the tax on financial transactions. These costs certainly are inevitable; however, by simplifying tax rules, they can be avoided or minimized to some extent.

Indirect costs are those that affect the tax debtor in such a way that paying taxes reduces their possibility of generating income. For example, constantly calling the taxpayer to come to the tax office etc.

## 6. Conclusion

Tax principles reflect the economic, political, social and other conditions that determine the nature, place and role of taxes. Tax policy is created under the influence of various conditions, among which tax principles do not necessarily play a leading role. That is why these principles should not be abstract. Science must shape their content taking into account the situation existing in a given country.

When formulating the tax principles, one should bear in mind the role of the tax system and tax policy within the system of public revenue and expenditure, as well as within the whole economic system of the country. Therefore, the content of tax principles has changed over history.

Tax principles that are being established apply to the tax system as a whole, and not for each individual tax form in this system. It is not required that each individual type of tax satisfies all tax principles, but it is required that all taxes, taken together, satisfy all tax principles.

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## CRIMINALISTIC STRATEGY - STRATEGIC CHOICE

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**Abstract:** The strategy is the mode of implementation of the defined objectives. In fact, it essentially gives us the answer to the question of how to achieve the goal? Properly defined system of strategy of criminal activity gives quality perception and anticipation of a crime of interesting phenomena. Strategic choices are implemented by defining a strategy plan that allows the realization of the objectives of the proper allocation of resources and the implementation of measures to effectively combat organized crime and other forms of crime. In this sense, strategic planning involves the framework of the strategy for the optimal application of law enforcement resources to solve the problem of crime. Regardless of the type of strategic work, in general any strategy is implemented through strategic analysis, strategic choice and creating strategic change. The focus of this paper is focused on the strategic choice that represents the delicate phase of implementation strategies. With the proper choice of alternatives we can implement changes and achieve the priorities set by strategic vision. In this paper, among other things, we get a closer look at a variety of analytical techniques that facilitate the resolution of the basic dilemma in the choice of strategy alternatives, which is placed in front of a police organization, which is: where is it? where it wants to be there and how can it get there?

**Keywords:** crime strategy, strategic choices, organized crime, analytical techniques, *SWOT* analysis, scenarios.

### INTRODUCTION

The logical step after strategic analysis is the choice of alternatives which is impossible without a clear vision, understanding of the environment and assessment of its own capacities. Strategy choice in the implementation of criminal strategy should enable the police organization, the implementation of innovative changes that will enable more efficient problem solving of crimes. At this stage there are questions concerning the continuity or discontinuity of the action of the police organization, the scope of changes, timelines, and a driving force in the organization and their role in implementing changes. The most useful option when it comes to the strategic choices, must be viewed through the prism of its consistency with the strategic vision, because it may be unfeasible due to the fact that internal capacity of organization is not suitable to the basic strategic orientation (Card; Fairholm, 2009: 23).

A crucial stage in the process of strategic decision-making is a choice of alternative that is the most acceptable. This activity carries with it the *burden* of risk which means that we are aware of the lack of knowledge about the outcome of certain alternatives. Choosing an alternative means deciding on the selection of alternatives that will help us implement changes and achieve priorities. Decision-making requires a high degree of creativity and innovation, and a willingness to take risks for the decision. In order to select the first alternative there should be a set of criteria that enables objective comparison of them.

When reflected on the field in order to oppose the various manifestations of criminal phenomenon, each choice of alternative, must leave the space and the ability to adapt to changes in the environment (certain degree of flexibility). The chosen alternative must be a consistent one i.e. to match the resources and potentials of the police organization and the state of the

environment in which it exists. The concept of the crime strategy, through its basic settings and appropriate strategic choice should prioritize policing based on information and knowledge (Ratcliffe, Guidetti, 2008: 116). Strategy choice must be explicitly expressed through the creation of an action plan. This activity basically is a definite need for change through a documented form of selected activities in the form of a decision in a defined temporal and spatial framework, with real subjects and specific financial needs.

Defining this and making this real is the basic principle used in planning, because it makes it possible to define a line of specific tasks that are simpler to achieve and they enable the organization to implement them easily. Opposite this approach, we have defining of the complex tasks that include more than one area and require much more effort in their implementation. These kinds of conceptions often end in failure, especially if it is a bureaucratic organization, which is in most cases the police organization. However, the defined tasks should not be too simplified, because they have to present a challenge for the organization and generate creative energy with employees, which will lead to innovation and make changes in the organization come true.

Creating a strategic plan involves a strong leadership role of managers, who are aware of the organizational potentials and resources. Based on that, they will be able to properly assign roles to the staff in the implementation, as well as define realistic time frame for implementation, and also motivate staff in achieving strategic goals. Their especially important role is, that through the process of planning, individualize responsibility for the implementation of specific tasks, which will allow easier monitoring during the implementation and responding to any anomalies that may arise in the implementation phase.

Strategy choice involves selection process of the approach to be used in policing through the development of alternative approaches in solving a crime problem, then making a decision on priorities and creating a plan of strategic policing. In strategic policing conceptualized in this way, very often the ability of employees to evaluate the quality of information, generalize, define priorities, exercise selection and choice of alternatives can be seen, and this requires a high level of criminalistics knowledge and managerial abilities in work with people.

### **Using analytical techniques as a support to selected strategy choice**

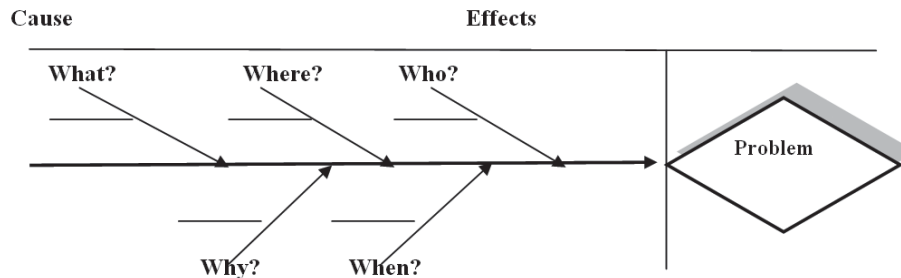
Strategy planning is the product of a managerial process and a reflection of the choice of strategy, that helps the departments focus their energies and resources in a better manner and ensure that all members work toward the same goal. Basic dilemma is-Where is the organization now? Where does it want to be? How can it get there? This can be solved by choosing strategic alternative that becomes the *vision* of law enforcement organization. In this process of searching for alternatives it is difficult to make a *perfect* choice, because there is a limited time framework for action. Therefore, there is a need for defining simpler alternatives, which can be implemented in reasonable time framework, and which enable to get the process in organization started and reach their goals. When considering goals, a department can use the acronym *SMARTER* to create *specific, measurable, acceptable, realistic, and timely* goals that *extend* the capabilities of those working to achieve them while being *rewarding* for the organization and its members.

Significant support in the selection of strategy alternatives can be provide by analytical techniques that exist and are used in economic relations, but can also be applied in and the decision-making process of policing. In the following paragraphs we will present the basic characteristics of some of these tools, like: Ishikawa diagram, brainstorming, SARA, PESTL, SWOT analysis and scenarios.

Cause-and-Effect Diagram (Ishikawa diagram) shows visualisation and analysis of different causing factors classified in categories that are connected with a specific event.<sup>1</sup> This kind of graphic design of information greatly simplifies and makes it easier to understand this problem and gives analytical insight into its different aspects. There are different variations of this diagram depending on the area where it is used, but for the purposes of this paper we will show the so called 5W diagram (Who? Where? What? When? Why?), which is the general model that can be applied to policing and law enforcement problems. (picture1)

<sup>1</sup> See in detail, in: Ishikawa, K. (1985). What Is Total Quality Control? The Japanese Way. Englewood Cliffs, New Jersey: Prentice-Hall.





Picture 1: Ishikawa diagram (5W diagram)

*SARA* is an acronym made of words that show the essence of this technique: scanning; analysis; response; assessment. This is a technique which is used in problem-oriented policing and it is used for developing model for cooperation between police and community (Cordner; Perkins Biebel, 2005: 157). *Scanning* is used for selecting problems for closer examination and focussing attention to a specific problem, which requires comprehensive answer in policing. This activity involves identifying recurring problems and their consequences for the police and the community. Also, determining how frequently the problem occurs and how long it has been taking place as well as prioritizing of problems and developing broad goals. *Analysis* involves identifying problem by recognizing key elements as well the analysis of those elements. It also involves identifying and understanding the events and conditions that precede and accompany the problem, identifying relevant data to be collected, taking inventory of how the problem is currently addressed and the strengths and limitations of the current response, identifying a variety of resources that may be of assistance in developing a deeper understanding of the problems as well as developing a working hypothesis about why the problem is occurring. Response includes choosing the best option for solving a problem and creating a plan for action and implementation. The focus at this stage is on searching for what other communities with similar problems have done, choosing among the alternative interventions, outlining a response plan and identifying responsible parties, stating the specific objectives for the response plan, carrying out the planned activities. Assessment refers to the evaluation of the whole process and recognizing the anomalies which can be remedied in the following process. This means: determining whether the plan was implemented (a process evaluation), determining whether broad goals and specific objectives were attained, identifying any new strategies needed to augment the original plan and conducting ongoing assessment to ensure continued effectiveness.

*PESTL* is the acronym of English words that stands for *political, economic, social, technological and legal* factors that can have effects on law enforcement agency. *PESTL* stands for the analysis of the external factors and their influence on the organization, which is very important for choosing adequate strategic alternative (Williamson, 2008: 325). Each of these factors should be analysed through the prism of the effects of the police organization in order to identify the changes and their causes (Figure 2). Thus, the political changes in the countries in transition may strongly influence the police organization through the change of management structure bringing so-called eligible staff, which has nothing to do with their competence and promotion system. Also, the key turns in the areas of legislation, such as the introduction of the concept of prosecutorial investigations in our country, require fundamental changes in the police organization. Then, the abuse of modern technological advances in criminal activities requires constant adapting of criminal methods to new modes of crime offences. Of course, other factors in the social and economic sphere can strongly influence the police organization, which requires continuous activity in the assessment of their influence.



Factors	Changes	Consequences	Threats	Opportunities	Autonomous actions	Possible measures
Political						
Economic						
Social						
Technological						
Legal						

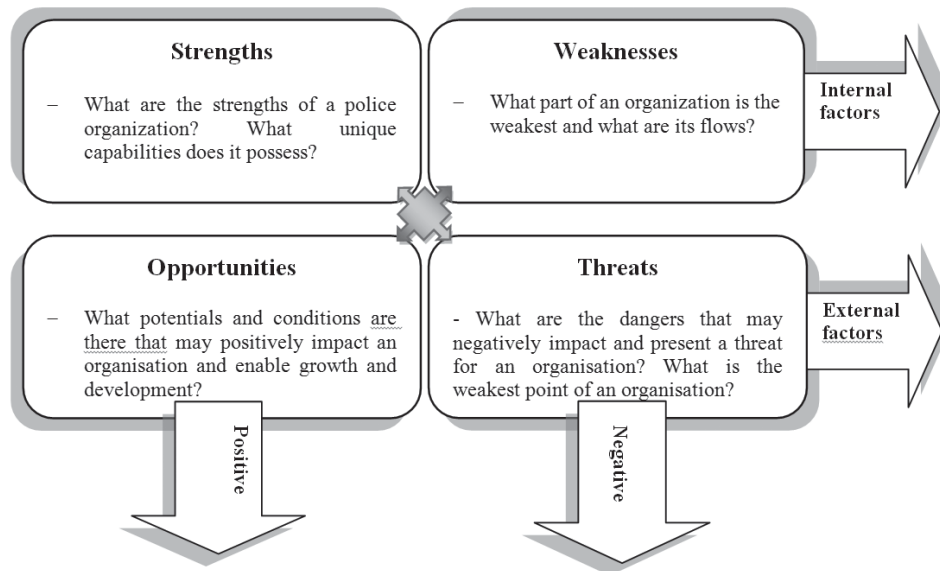
Picture 2: Model table for PESTL analysis<sup>2</sup>

Brainstorming is a technique that involves the participation of a large number of people in a creative process of analysing the risks, consequences, alternatives and possible solutions to the problem. In this creative process comes to combining different ideas in a short period of time, their connection and selection in order to select the acceptable alternative. During the implementation of this technique, good preparation and conducting of the session is very important, as it enables better focusing of intellectual capacities, preventing dispersion of ideas and guides problem-oriented work. Modern trends in this area bring innovations which are related to the field of so-called electronic *brainstorming* which involves the use of computer technology in this process (Michinov, 2012: 223). This technique is applicable to criminal problems which are being solved by teams of criminologists, because it enables the free expression of ideas, better understanding and the interaction between the team members. It can also be used in the selection of strategy alternatives, as it enables integral perception of the problem by plurality and heterogeneity of ideas that can be crucial for selecting certain options.

### SWOT analysis as a strategic planning of greater quality

SWOT is an acronym that stands for assessing an agency's *strength, weakness, opportunities and threats*. These words show the basic focus of the analysis and at the same time the main parts that are examined and analysed. SWOT analysis is used for reviewing of the organization's environment, both internal and external in order to choose and create the over-all strategic plan. Thus, based on this SWOT analysis, relevant information about the strengths and weaknesses of the police organization, as well as information about opportunities (chances) and risks in an environment where exists (Figure 3), can be obtained. Point of the analysis is focused on getting answers: how to exploit the strengths of organizations to use the opportunities and to defend against threats from the environment and how to alleviate weaknesses of the organization so that they don't affect the use of the opportunities and defending against threats in the environment?

<sup>2</sup> Image taken and adapted to the work of Aeppli, P.; Ribaux, O.; Summerfield, E. (In 2012). Decision-making process in the police. Belgrade: The Academy of Criminalistic and Police Studies and DIKAF, p. 77



Picture 3: Graphical representation of SWOT analysis<sup>3</sup>

**Strengths**—this segment refers to everything that works well in an organization i.e. the advantages you have over the others. Advantages of the law enforcement agency can be reflected through: the ability, skills, innovative skills, resources, positive motivation, quality management, good education system and system of professional training and development of police officers and the like. Basically these are the potentials that are hard to compete with, or mimic, and on the other hand they are integrated into one efficient system.

**Weakness** – refers to key disadvantages that are already present and can affect the survival of the organization, but can also be a reflection of the shortcomings that can be overcome by creating better organization. These are the areas where, and because of which the law enforcement agency is not at the desired level of work, and they refer to restrictions or lack of resources, skills, knowledge, and have an impact on the productivity and performance of the organization. When we talk about the police organization, very often, we refer to: the bureaucratic model of organization, lack of a clear strategic plan, inadequate equipment, below-average results, corruption within the organization, the lack of managerial and other skills, overburdening internal problems, undeveloped criteria for advancement, developmental delay, below-average communication skills, lack of resources, high costs, and more. They should be given special attention when choosing strategy alternatives, because by identifying them, eliminating or reducing them, we will enable smooth development of the organization.

**Chances** are related to the actions that the organization could potentially take over, which could contribute to meeting and fulfilling the strategic objectives. So, when we talk about the law enforcement agency potential opportunities are diverse, such as: projects funded by international organizations, donations of equipment, membership in international organizations, training of employees abroad, the political will about the fact that one of the central priorities is the fight against corruption and organized crime, the use of results of scientific research of criminal phenomenon in criminal practice and reality, the development of common databases of state authorities, media support and so on. Good knowledge of the criminal phenomenon is important for identifying strategic opportunities that enable long-term effects, as opposed to partial and short-term effects. Available opportunities or chances have a very significant impact

<sup>3</sup> The different pattern variations for this type of analysis, and the software which make graphic representation easier (e.g. Edraw Max) may be found on the Internet: <http://creately.com/blog/examples/swot-analysis-templates-creately/#SwotRealWorldData>.

on the work of the police, because unless there isn't a sufficient level of sensitivity in relation to the environment of the activities of the organization are reduced to the administrative level rather being an organization based on the knowledge that change their environment for the better.

*Threats* are related to changes in the environment that affect the growth and development of the organization, and therefore its survival. Threats to law enforcement agency may be different, such as: an increase in crime rates, new forms of crime, *endemic (system)* corruption, limited budget resources, adverse publicity in the media, and the like. Most threats can be controlled to some extent, namely, the right choice of strategy alternatives will allow the police organization to identify and control threats by preventive activities. Also, by using the analysis we will notice and recognize critical points in any situation and will plan measures that provide an adequate response.

During the *SWOT* analysis it is very important to determine the dependency relationships and mutual effects between the factors identified, because an isolated observation of these parameters may lead to erroneous conclusions. In fact, when we talk about policing the things we encounter most often are divergent, and these can be foresighted only with some level of probability.

By using this analysis, the strategic choices can be recognized by associating and matching strengths and weaknesses of the police organization with opportunities and threats in the external environment. It essentially represents an effective way of organizing information and sensitive features and can be the basis for selection of strategy alternatives and the creation of action plans (Valentin, 2001: 55). It is relatively fast, clear and effective. However, one should bear in mind that, like most of the analysis, it doesn't often give specific answers, which requires the use of other methods as a support for decision-making within the organization.<sup>4</sup>

When a law enforcement agency uses this type of analysis, in general, it tends to minimize its weaknesses and threats in the environment and to maximize their strengths and opportunities in the region. By choosing strategy planning alternatives, the results of *SWOT* analysis should enable:

- building and strengthening the quality parts of police organizations;
- minimizing weaknesses by using appropriate measures;
- expanding opportunities in the environment with creativity and innovation;
- defining hazards and construction of appropriate modes of defense.

It should be noted that this kind of analysis is an effective and simple way by which we can ascertain the real state of the organization, as well as the opportunities and threats that lurk around, but it is necessary to objectively consider all its virtues and vices, and on that basis conclude which strategic alternative should be chosen. During this process one should bear in mind that some features are more important, some are irrelevant, and also, some weaknesses can be crucial, some irrelevant or easily correctable, very often, some opportunities may be more attractive than others. *SWOT* analysis is essentially a systematic way of identifying crucial factors of an organization and modes that can use these factors in best possible manner. An adequate strategy planning should enable the law enforcement organization a successful balance of strengths and weaknesses with opportunities and threats, which enhances its developmental prospects.

#### **Scenarios as a support to strategic choice**

The scenario is the image of the observed object of policing in the future. They are commonly used for planning, decision making and selection of strategy alternatives. They are used for investigating a possible future conditions which are described by a set of assumptions. Of course, it is impossible to predict the future, however, there is tendency for creating more plausible scenarios in order to foresight interesting crime events. Scenarios make it possible to detect changes through which the object of policing goes through and provide the basis for preparing a response to the events that will follow.

When the scenario is created the job of an analysts is to select leading indicators and signposts that suggest that the assumed scenario is realized. Indicators allow you to monitor

<sup>4</sup> In addition to this type of analysis what can be used is for example: Porter's five forces model (competitive advantage is described and analysed through five basic factors – entry barriers, negotiating power of customers, negotiating power of suppliers, substitutes and competitors) the analysis of influencing factors, Pareto diagram and others. See more in: Tagués, N. R. (2004a). : The Quality Toolbox. Second Edition, Milwaukee: ASQ Quality Press.

the development of the event and based on the previously elaborated procedure in the scenario to take specific actions. Also, the scenario provides more alternatives or more scenarios, this approach allows a wider applicability of elaborated procedures and more effective strategy choice. There are different types of scenarios that are used in various fields, and for the purposes of this article we will tell you something more about the demonstration scenario, system-change scenarios of the and the scenarios that monitor changes of the object of policing due to the effects of various factors (Mietzner, Reger, 2005: 225).

Demonstration scenarios represent a look into the future of the observed system, that is, a description of a future state in a given time interval, and then the description of events that would lead to expected, supposed condition. This type of scenario points out how we get to a hypothetical situation by following the course of events in stages, and what kind alternatives for each of the phases present in them that preventive and repressive measures which affect the outcome of events. The main disadvantage of this type of scenario, is the fact this type of scenario depends mainly on the ability of the creator of the scenario to use his/her experience, imagination and intelligence to determine future state of the system.

The scenarios that monitor changes of the object of policing due to the effects of various factors require a few basic steps in creating scenarios. In fact, the main factors affecting the object of policing should be examined and studied first, then one should determine how they change over time and in which way the changes affect policing, notice the possibility of new factors that have an impact over time, and eventually display the object at a certain point in time. The essence of using this type of scenario is the correct selection of the factors that have the greatest impact on the object and monitoring of action of these factors. The disadvantage of this type of scenario is inability to foresight with certainty the key factors that have an influence on the object of policing. This can lead to wrong assumptions and negligence of other factors that can have a major impact in a given situation.

System-change scenarios include the monitoring of the crucial factors that affect a system and a making of connection between the system components, and all is monitored in order to foresight the future state. This kind of scenario is a synthesis of the two points of view that are explained above. So, in this kind of scenario we have both views incorporated, and the perspective that underlines the observation of the dynamics of changes in the factors that affect the system, and show connections between the system components and their dynamics. Creating this kind of scenario is more complex and requires maximum effort from the analyst.

Developing of a scenario framework is similar to developing models and simulations. Therefore, we can say that a scenario is a kind of model that tries to foresee future events. The process of developing a scenario framework or scenario-writing process goes through four stages: defining a problem, identifying factors that affect the problem, identifying possible solution and finding the best solution (Berkhout; Hertin, 2002: 46).

Developing of a scenario framework starts with defining the problem, and one should be focused on the question for which we seek an answer. So, we need to make a consensus on a particular issue, which should be as clear and accurate as possible and reflect the needs (how it will develop a certain criminal organization in the future? What kind of narcotic drugs will appear on the market? Will criminal organizations do some legal business in order to support their criminal activities? etc.). Identifying the factors that influence the problem is the stage at which it should be determined what the crucial factors in the current environment are. Then, we should observe an individual impact of these factors in the present and make assumptions about their plausible actions in the future. Factors that we consider may be different, but most commonly observed ones are social, economic, political and technological factors. The next step is to select the key elements of the system that we observe under the influence of various factors. Key elements of the system can be extremely influential to the action of the object of policing in the future. Possibility of forecasting future plausible operations of the system depends largely on the proper selection of key elements of the system.

The next step in creating scenarios is to identify possible solutions. At this stage, the analyst selects the approach which he will use when developing scenarios. The most commonly used approaches are those based on the knowledge and observation of the object's activity of policing in the past and so-called, 'what if'- approaches. Scenarios that are made on the basis of knowledge and observation of the previous actions of a subject use the knowledge

and experience in their work to solve the existing problems. In fact, the existing solutions are adapted to new situations, and the old ones are used to critically examine new ones, and also, the existing knowledge is used to interpret new situations and create solutions similar to the existing ones. Using the 'what if' approach for identifying possible solutions and outcomes within the scenario framework, points to the interdependence between different events, how a particular event affects the environment, the time interval in which the foreseen events will happen, the development path of the observed system, the connections between the elements of the system and connection with the environment (Ratcliffe, 2006: 51). In this approach it is important that the analyst in the script tries to include as many different variations of foreseen events.

The final stage in the development of scenarios framework should indicate the best solution for the situation described in the scenario. The purpose of developing scenarios is that in the case of fore seen course of events we have them easures defined through a strategic choice, prepared. They will prevent harmful consequences of these events. An important role in monitoring the course of events have indicators that are defined in the scenario, and suggest that the very specific scenarios should be implemented in the current situation. Without the existence of these indicators it would be difficult to take notice of the fact that certain events predicted go in a certain direction. For identification of certain stages of predicted course of events markers are used and these markers make the group of indicators that shows that a particular stage has occurred. This is important and because of this the planned measures can be taken at the right time and the adverse consequences can be minimized at the lowest possible level.

## CONCLUSION

Analytical techniques give us the answers about the level of difference between the current and desired situation defined by strategy vision. Namely, if the level of difference is small a decision will be directed towards alternatives that imply the allocation of resources and increase of synergy between the existing organizational structures, which essentially means that the changes will be modest and internally oriented. On the other hand, if the level of difference is big a decisions will be focused on alternatives that can bring fundamental changes i.e. crucial organizational changes that are externally oriented. The very choice of alternative should be a process where managers make the right decisions at the right time.

An important part in the decision-making process will be the attitude towards risk, which will guide the decision towards elimination of some and favoring other strategy choices. In general, managers accept and see the existence of such risk as factors of success and their activities tend to minimize its impact. The level of risk which is accepted by choosing alternative should be proportional to the resources of the police organization, but also it should be proportional to the willingness of employees to accept it. Capacity itself is not enough to take action, and what is necessary is positive motivation of employee who can implement and create changes in all areas of police organization.

The long-term course of action is defined by the strategy and that ensures the achievement of the objectives of the organization through various forms of decisions on the allocation of resources across the organization. Crime strategy specifies the decisions taken, and shows the way to the finish line. In this context, this means that a long-term plan is necessary for solving one or more problems of crime. Essentially, we can conclude that, if a make a bad plan, the implementation of that plan will be bad, that is, if we've chosen the wrong strategy alternative, it is unrealistic to hope to achieve strategic goals.

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## MAPPING FEAR OF CRIME IN LOCAL COMMUNITIES IN MUNICIPALITY TRBOVLJE

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**Abstract:** Fear of crime can seriously impact the life of local community residents through their daily routines. Criminology has studied causes for and consequences of the fear of crime since 1960, but mapping of crime and fear of crime has not begun until the beginning of the 21<sup>st</sup> century. In general, the results of these comparisons show how applicable this new method really is.

The aim of this paper is to identify, analyse, and illustrate the level of fear of crime in connection with a number of reported criminal offences in the year 2012 in ten local communities in the municipality Trbovlje, Slovenia, by using the ArcGIS mapping program. In our study, we combined the data from the official police crime statistics for the municipality of Trbovlje with thereto related survey on fear of crime. The analysis of the reported crime revealed that the prevailing form of crime is that against property, with the relevant crime rate being higher in more urbanized local communities in great part located in the centres of said municipalities. The analysis of the fear of crime in local communities revealed that past victimisation, social disorder, social interactions and networks within the neighbourhood, and vicarious victimisation are the factors with the weakest impact on fear of crime. Only the factor presenting the consequences of the possible victimisation has the strong impact on the fear of crime in all analysed local communities. Finally, these findings are a solid ground for the police to implement more formal social control and community policing with the intent of reassurance, as well as a good starting point for further studies on the mapping of the fear of crime.

**Keywords:** crime mapping, fear of crime, municipality Trbovlje, local communities.

### INTRODUCTION

The development of crime mapping in Slovenia started in the 1990's. Over the last two decades, Geographical information systems (GIS), which enable the creation of manageable maps through their advance functions and detailed analyses of occurrences of criminal acts, became the main crime mapping tool. The present study focuses on studying connections between crime rates and the perception of safety by the population in the municipality of Trbovlje. The study aims to combine crime mapping and studying fear of crime, which means the fear of individuals from acts that create fear.

The article defines the basic concepts on studying the fear of crime. The main part of the article presents the case study carried out in the municipality of Trbovlje, where we used police statistics and a questionnaire on the perception of safety among the population to identify crime clusters and levels of fear of crime in local communities, and presented the identified occurrences on crime maps with software ArcGIS. The review of results at the end of the article also includes proposals for the improvement of the situation in local communities in the municipality of Trbovlje.

## STUDYING THE FEAR OF CRIME

The beginnings of fear of crime studies date back to the 1960's, to the issue of the collection "The Challenge of Crime in a Free Society"<sup>1</sup>. Variables, such as race, social status, gender, age and past victimisation have an impact on the fear of crime. Brooks<sup>2</sup> claims that fighting fear of crime is more difficult than fighting crime due to the irrational characteristics of fear itself<sup>3</sup>.

Fear of crime has an important impact on the quality of life. How fear impacts an individual's reactions is visible in physical and psychological changes, and behavioural adaptations, like avoidance and protective behaviour. Behavioural adaptations affect the individual and the society in the economic sense. The theoretical connection between fear of crime and chaos and crime was established with the Broken windows<sup>4</sup> theory<sup>5</sup> and the Disorder and Decline<sup>6</sup> theory<sup>7</sup>. Criminology includes four groups of theories (victimisation, demographic, social and environmental theories), which explain the reasons for fear of crime. Victimisation theory of opportunities and risks explains that the rationally motivated offender commits a criminal act against the potential victim if the opportunity (time and space) arises and in the absence of guardians<sup>8</sup>. Demographic theories study the fear of crime based on past experience with crime or feelings of vulnerability. Demographic theories are divided into: 1) theory of direct victimisation, 2) theory of indirect victimisation (media and fear of crime, interpersonal communication and fear of crime), and 3) vulnerability theory<sup>9</sup>. Social theories explain that the fear of crime is a reflection of the general state of anxiety caused by a sudden change in society or a change in its factors. This state is evident in feelings of insecurity or uncertainty, fear of the destruction of the social organization of community, fear of the unknown, fear of poor social integration and the state of the community, as well as fears caused by rapid social changes. Social theories are divided into: 1) risk society theory, and 2) social disorganization theory (subculture diversity, social integration/cohesion in the community, concern for the community and social change)<sup>10</sup>. Environmental theories focus on external environmental factors causing fear of crime. Signs of disorder and other factors in dangerous/disorderly environments could cause fear of crime. Environmental theories include: 1) disorder and decline theory, 2) crime signs theory, and 3) theory of dangerous/disorderly and safe/orderly environments<sup>11</sup>. The conventional models of police activities do not focus on fear of crime. Consequently, this area is covered by problem-oriented, zero-tolerance and community-oriented models. According to the problem-oriented theory, police work focuses on prevention (annulment of problems before crime occurrence).

The prevention process is carried out on the basis of the SARA model (scanning, analysis, response and assessment), in cooperation with public agencies and the private sector. Police activity based on the zero-tolerance model acts prevents disorder from escalating into crime or causing fear of crime. It is based on the principle that police intervention against disorder reduces criminal activities and the deterioration of the community. The community-oriented police activity is evident in a partnership between the police and the community, proactive problem solving and the inclusion of the community in the settlement of problems associated with crime, fear of crime and other problems in the community<sup>12</sup>.

1 The Challenge of Crime in a Free Society is the booklet of surveys conducted in the field of fear of crime in the United States by various American researchers. Studies have shown that fear of crime has a negative impact on the quality of life of Americans; B.J. Doran and M.B. Burgess, *Putting Fear of Crime on the Map*, London, 2012, p. 1.

2 J. Brooks, J., *Crime and Delinquency*, 1974, p. 241-245.

3 B.J. Doran and M.B. Burgess, *Putting Fear of Crime on the Map*, London, 2012, p. 1-8.

4 Broken Windows Theory establishes norms and signalling effects of urban disorder or vandalism in the development of crime and anti-social behaviour. The theory states that by monitoring and maintaining an orderly urban environment, we can stop the vandalism and prevent the escalation of serious crimes; B.J. Doran in M.B. Burgess, *Putting Fear of Crime on the Map*, London, 2012, p. 11-13.

5 J.Q. Wilson and G.L. Kelling, *The Atlantic Monthly*, 1982, 29-38.

6 Disorder and Decline Theory examines the concept of disorder, which refers to minor offenses and other forms of disruptive behaviour and conditions that have a potential impact on quality of life in the community. The theory states that minor offenses, which are not paying attention, can escalate into more serious crimes, which would lead to fear of crime of the population and consequently redone due to the behaviour of the population destabilization of communities; B.J. Doran and M.B. Burgess, *Putting Fear of Crime on the Map*, London, 2012, p. 13-16.

7 W.G. Skogan, *Disorder and decline: crime and the spiral decay in American neighbourhoods*, Los Angeles, 1990.

8 L.E. Cohen and M. Felson, *American Sociological Review* 44, 1979, p. 588-608.

9 B.J. Doran and M.B. Burgess, *Putting Fear of Crime on the Map*, London, 2012, p. 25-30.

10 B.J. Doran and M.B. Burgess, *Putting Fear of Crime on the Map*, London, 2012, p. 31-38.

11 B.J. Doran and M.B. Burgess, *Putting Fear of Crime on the Map*, London, 2012, p. 38-44.

12 B.J. Doran and M.B. Burgess, *Putting Fear of Crime on the Map*, London, 2012, p. 51-56.

The Crime Prevention Through Environmental Design (CPTED) strategies are based on the theory that the “correct” design and effective use of the environment reduce the possibility of incidents and the emergence of fear of crime, and contribute to a better quality of life<sup>13</sup>. The goals of the strategies are to change the physical environment in a way to reduce criminal activity (and consequently reduce fear of crime) and to encourage individuals to use public space, which they avoided in the past<sup>14</sup>.

Fear of crime is defined as an emotional reaction – concern about crime or a reaction to signs an individual associates with crime. This definition of the fear of crime alludes to the fact that certain forms of recognizing potential danger, called perceived risks, are necessary for evoking fear<sup>15</sup>. Defining fear as emotion is important for differentiating between otherwise associated emotional and cognitive reactions to crime, which are conceptually different. Carlson and Hatfield<sup>16</sup> define emotion as a specific mental state, which includes physical responses that stimulate or slow down motivated behaviour. Skogan<sup>17</sup> understands cognitive evaluation as an individual’s judgments of crime (assessment of personal risk and general concern of crime). Ferraro and LaGrange<sup>18</sup> were the first to present the difference between emotional and cognitive perceptions in taxonomy<sup>19</sup>.

Fear of crime occurs in two dimensions, whereby the first refers to the type of victimisation (personal or property), and the second focuses on the subject of victimisation (personal or altruistic). Garofalo<sup>20</sup> claims that the level of fear and reactions to fear vary based on physical threats that affect an individual or property<sup>21</sup>.

Research of fear of crime takes place through three approaches: cognitive, affective and behavioural. The cognitive approach consists of the global measurement, based on the perception of risks, and the measurement of values and fears, which evaluates individual opinions on the gravity of crime in their community. Contrary to the cognitive approach, which is based on individual perceptions of safety, the affective approach focuses on the emotional reaction and tries to measure fear of crime in the “literal sense”. In contrast to the global measurement, the emotion-based measurement focuses on the specific type of crime. The behavioural approach studies the protective measures and avoidance strategies of individuals, who try to reduce their fear of crime. Protective measures include strategies of personal control and collective actions. Avoidance strategies on the other hand include actions that reduce the exposure to crime and distancing oneself from situations that represent high victimisation threats.

Traditional statistical techniques, including bivariate analyses, Pearson correlation coefficient, Spearman’s correlation coefficient, Chi-squared test and complex analyses, are used for analysing fear of crime<sup>22</sup>. Due to the need for visual presentations of areas with a high occurrence of criminal acts the first attempts of crime mapping and later also mapping of the fear of crime took place already in the 19<sup>th</sup> century.

In Slovenia, six extensive studies, which included crime analysis together with the mapping and use of GIS tools, have been conducted. In 1975, Pečar<sup>23</sup> examined the interconnectedness of deviance with physical and demographic factors in the capital city Ljubljana by using cartograms and discovered that crime and offenders are very unevenly distributed around the urban area of Ljubljana. The results showed that the most problematic and burdened in respect of concentrations of deviants are city centre due to alcoholics, housed in areas with old buildings in the centre and predominantly urbanized areas outside the city (i.e., dormitories).

In late 1970 a survey 'Determination of 'black spots' on the main roads of the Socialist Republic of Slovenia' was conducted. Zemljič and colleagues<sup>24</sup> analysed 5,796 official traffic accidents records for a period of three years; 1976–1978 and identified 323 dangerous places, or so called black spots, where the probability that a traffic accident will happen is much higher.

13 T.D. Crowe, *Security Management* no. 35/1991, p. 81.

14 B.J. Doran and M.B. Burgess, *Putting Fear of Crime on the Map*, London, 2012, p. 56-61.

15 K.F. Ferraro 1995, *Fear of crime: interpreting victimisation risk*, Albany, 1995.

16 J. Carlson and E. Hatfield, *Psychology of emotion*. Forth Worth, 1992.

17 W. G. Skogan, *Disorder and decline: crime and the spiral decay in American neighbourhoods*. Los Angeles, 1990.

18 K. F. Ferraro, *Fear of crime: interpreting victimisation risk*, Albany, 1995.

19 B.J. Doran and M.B. Burgess, *Putting Fear of Crime on the Map*, London, 2012, p. 67-68.

20 J. Garofalo, *Journal of Criminal Law and Criminology* 72(2), p. 839.

21 B.J. Doran and M.B. Burgess, *Putting Fear of Crime on the Map*, London, 2012, p. 71-72.

22 B.J. Doran and M.B. Burgess, *Putting Fear of Crime on the Map*, London, 2012.

23 J. Pečar, *Gostive nekaterih deviantnih pojavov v Ljubljani*, Ljubljana, 1975.

24 V. Zemljič, T. Kastelic, T. Šibenik, I. Zajec, M. Bogataj, B. Brvar et al., *Ugotavljanje črnih točk na magistralnih cestah SR Slovenije*, Ljubljana, 1979.

Meško, Dobovšek, and Bohinc<sup>25</sup> for the first time used GIS for crime mapping as they analyzed the distribution of deviance in Ljubljana. The results revealed the distribution of reported crimes in different parts of Ljubljana. Almost the same locations were identified in the survey of Klinkon, Meško, and Rebernik<sup>26</sup> and Meško, Maver, and Klinkon.<sup>27</sup> The most problematic and with crime most burdened areas (with identified hot spots) are:

- 1) the shopping and entertainment area called BTC;
- 2) the city centre together with the main railway and bus station;
- 3) the city quarter Tabor situated very close to the methadone centre; and
- 4) the neighbourhoods on the outskirts of the city, such as Remiza, Trnovski pristan and Nove Fužine.

Eman, Györkös, Lukman and Meško<sup>28</sup> have introduced the use of GIS in the Slovenian area, in two studies: 1) an analysis of property crime hotspots in the cities of Ljubljana and Maribor in 2010 and 2) project *krimistat.si*. The results of the first study showed the concentration of property crime offenses in the city centre and spread in the direction of the main road towards the outskirts of the cities. At the same time they perceived a greater number of property crime offenses in shopping centres and entertainment areas. *Krimistat.si* project is a web application that combines data from police statistics with Google maps application. The purpose of the project was to create an application that would be accessible to all and nice to use, but there are obstacles in the form of personal data protection, which prevents the use of web applications *Krimistat.si*

#### STUDY IN MUNICIPALITY TRBOVLJE

The region Zasavje consists of three industrial collapsed cities: Zagorje ob Savi, Trbovlje and Hrastnik. We decided to conduct study in city Trbovlje because there are most prominently seen poor economic and social standards in the region's cities. The comparison of statistics with other cities in the region shows that there are<sup>29</sup>:

- the presences of the highest crime rate (Trbovlje: 292.5, Zagorje ob Savi: 213.0 and Hrastnik: 172.9);
- the highest number of recorded offenses (Trbovlje: 494, Zagorje ob Savi: 360 and Hrastnik: 170); and
- the highest unemployment rate (Trbovlje: 16%, Zagorje ob Savi: 10.7% and Hrastnik: 13.5%).

The area of municipality Trbovlje comprises 57.6 km<sup>2</sup>. Trbovlje is under the jurisdiction of police station Trbovlje, which is part of the Police Directorate Ljubljana. The municipality is divided into ten local communities (Alojz Hohkraut Center, Fakin Franc Franc Salamon, Ivan Keše, Fric Keršič, Klek, Zasavje, Cece, Dobovec), with a total population of 16,888 inhabitants.<sup>30</sup> Most of the population lives in an urban area of the 7 km long valley along the stream Trboveljščica, which in the south flows into the Sava River. Only ten percent of the population is living in 15 peripheral towns.

Crime mapping is becoming one of the most important tasks of the police, since the pattern recognition and criminal hotspots are important factors in the prevention of crime and the implementation of preventive activities. Foreign law enforcement agencies are confirming the central role of crime mapping in the field of crime prevention and are forwarding valuable lessons and models/methods of mapping the fear of crime. Following on from previous studies, we planned a study of mapping crime and fear of crime in the municipality Trbovlje. We were interested in visualization and actual distribution of crime in the year 2012 in the area of local communities of municipality Trbovlje. In order to achieve this we had to study and analyse the data on crime in the municipality of Trbovlje and then by using GIS transfer the research results to the map of municipality Trbovlje. Study on the sense of security of the population of the municipality Trbovlje was performed by means of a questionnaire, which helped us to identify the local communities in which the highest level of fear of crime was detected. Using GIS we transferred data to the municipality map of Trbovlje and compared them with the distribution of crime in the area of local communities, as shown below (Figure 1, 2).

25 G. Meško, B. Dobovšek and U. Bohinc, *Analiza porazdelitve nekaterih odklonskih pojavov v Ljubljani*, Ljubljana, 2003, p. 12-63.

26 I. Klinkon, G. Meško and D. Rebernik, *5. slovenski dnevi varstvoslovja*, Ljubljana, 2004, p. 836-847.

27 G. Meško, D. Maver and I. Klinkon, *Urbanization, policing, and security: global perspectives*, Boca Raton; London; New York, 2010, p. 301-322.

28 K. Eman, J. Györkös, K. Lukman and G., Meško, *Revija za kriminalistiko in kriminologijo*, 64 (3), 287-308

29 Statistični urad Republike Slovenije, *Prebivalci po krajevnih skupnostih občine Trbovlje*, 2013.

30 *Občina Trbovlje. Krajevne skupnosti*. 2013.

### The data collection

We selected crime cases in the municipality of Trbovlje from the crime database for the year 2012 and analyse the general classification according to the local communities of the municipality Trbovlje. Using ArcGIS software tool the coordinates of the crime cases were downloaded to the map of municipality Trbovlje. With analysing the content we were able to define areas hosting crime in the local communities. Due to weaknesses in the grid data on crime we were unable to identify around five percent of all detected cases on crime maps, but they were included in the analysis of crime in the municipality of Trbovlje.

In the study all ten local communities of the municipality of Trbovlje were included. Sample represented 350 adult respondents from ten local communities. The results of the questionnaire were analysed using statistical software tools, presented visually on the map of the municipality Trbovlje and compared with the crime distribution on the territory of the local community.

### Results

Statistics on crime in municipality Trbovlje show that in 2012 494 offenses were recorded (see Table 1). For the purpose of crime classification in specific areas, the classification of the Statistical Office of the Republic of Slovenia, made according to the provisions of the Criminal Code of the Republic of Slovenia (KZ-1), was used.

In addition to the relationships shown between the number of crimes on the territory of the municipality of Trbovlje and the national level of the Republic of Slovenia, we compared the distribution of individual offenses classified under the Criminal Code of the Republic of Slovenia (KZ-1) among local communities of the municipality Trbovlje, as shown in Table 1 below.

	A.H.	C.	Č.	D.	F.F.	F.Š	F.K.	I.K.	K.	Z.	Trbov. total	SLO
Crime against human rights and freedom		15			8		4	3		1	31	2652
Crime against human health	2	3			2		2	6		1	16	1812
Offences against the employment and social security		1								1	2	908
Crimes against the economy		5				1	2				8	5400
Offences against public order and peace		1			2		1	2			6	1087
Offences against legal transactions		3							1	1	5	1706
Offences against justice		2			1						3	299
Offences against property	30	131	4	3	36	21	30	14	5	46	320	66600
Offences against the general safety of people and property	1				2						3	337
Crimes against sexual inviolability		2				1					3	472
Offences against official duty and public authority		2									2	282
Offences against marriage, family and youth	13	5			5		19	33		1	76	2574
Crimes against life and limb	2	4	2		2		3	2	1	3	19	2864
TOTAL	48	174	6	3	58	23	61	60	7	54	494	90700
Crime rate*	264,2	503,2	115,1	64,8	164,1	404,2	219,0	234,4	113,8	954,1	292,5	440,5

\* Crime rate index: no. criminal offences / no. population x 10,000.<sup>31</sup>

\*\* A.H. – Alojz Hohkraut, C. – Center, Č. – Čeče, D. – Dobovec, F.F. – Franc Fakin, F.S. – Franc Salamon, F.K. – Fric Keršič, I.K. – Ivan Keše, Z. – Zasavje.

Table 1: Number of criminal offences in local communities in the municipality Trbovlje in 2012

31 Generalna policijska uprava, *Oddelek za načrtovanje in analitiko*, Ljubljana, 2013.



Table 1 reveals the pattern of reported crime in the municipality of Trbovlje. In addition to crimes against property, prevailing crimes in municipality are crimes against the marriage, family and youth, as well as crimes against human rights and freedoms. Among the analyzed criminal offences the least likely crimes to occur in 2012 were crimes against the employment and social protection and offenses against official duty and public authority. Majority of criminal offenses were detected in the area of the local community Center, followed by the local communities Ivan Keše and Fric Keršič. All three local communities are located in an urban area of the municipality. The least perceived criminal offences in 2012 were in local communities Dobovec and Čeče. These local communities are on the outskirts of the municipality and are therefore less urbanized compared to previous three located closer to the center. The crime rate is the highest in local communities Center, Franc Salamon and Zasavje. Local communities Franc Salamon and Zasavje are not on the top by the number of detected crime, but they have the highest crime rate due to the small proportion of the population.

Comparing to the area of the entire country, municipality Trbovlje as one of the 212 municipalities in the country has recorded 0.54 percent of all crimes in Republic of Slovenia. All of the above criminal offences were downloaded to crime map of municipality Trbovlje by using GIS, as shown on the figure below.

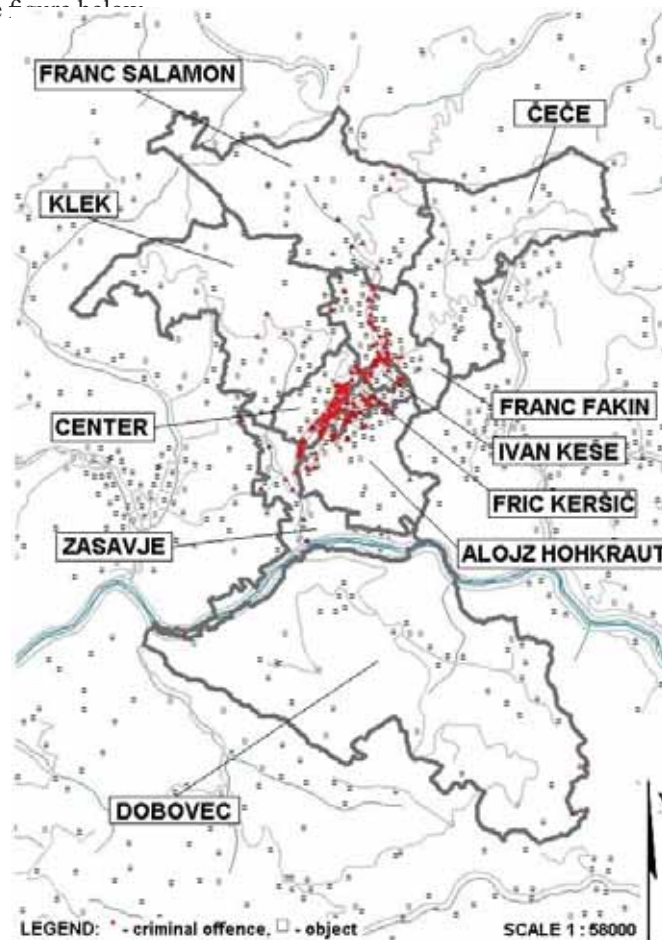


Figure 1: The crime distribution in the local communities in the municipality of Trbovlje in 2012

In a survey about feelings of safety of the population in municipality Trbovlje adapted questionnaire, previously used in the pilot study research of fear of crime in Ljubljana, was used<sup>32</sup>. The questionnaire consists of three parts: 1) adapted integrated model 2) adjusted Van der Wurff's socio-demographic and social-psychological model and 3) demographic data<sup>33</sup>. The sample comprised 350<sup>34</sup> adult respondents from ten local communities, in municipality Trbovlje (see Table 2), who answered questions from the fields of social cohesion in the neighbourhood, physical and social disorder in the neighbourhood, feelings of safety at night, the possibility of victimization, insurance property, plant health, physical fitness, the effects of victimization, past victimization and shared victimization. Average values of the fear of crime were calculated during statistical analysis which encompassed factor analysis and calculating average values of factors and their standard deviations for every local community in the municipality of Trbovlje. Number of crime offences, the crime rate and the average value of the answers of the respondents in the areas of fear of crime in the local communities are presented in Table 2.

Local community	Number of crimes	Crime rate*	Average values of the fear of crime (M)	Standard deviation (S.D.)
A l o j z Hohkraut	48	264,2	2,0051	0,5174
Center	174	503,2	1,9368	0,5466
Čeče	6	115,1	1,7487	0,5452
Dobovec	3	64,8	1,6352	0,4883
Franc Fakin	58	164,1	1,9112	0,5699
F r a n c Salamon	23	404,2	1,7948	0,5768
Fric Keršič	61	219,0	1,9147	0,5554
Ivan Keše	60	234,4	1,9349	0,5512
Klek	7	113,8	1,7694	0,5265
Zasavje	54	954,1	2,0806	0,4745
AVERAGE	49,4	292,5	1,8732	0,5352

\* Crime rate is calculated using the formula: no. criminal offences / no. population x 10,000.

*Table 2: The crime rate and the level of fear of crime of the population in municipality Trbovlje*

The data in Table 2 on the level of fear of crime in the local communities are shown in Figure 2 below.

32 G. Meško, J. Šifrer and L. Vošnjak, *Varstvoslovje* no. 14/2012, p. 259-276.

33 Hirtenlehner, Meško, and Vošnjak, *Monatsschrift für Kriminologie und Strafrechtsreform* no. 5/2009, p. 423-446.

34 Number of respondents and number of people living in local communities: Alojz Hohkraut – 43 (1817), Center – 59 (3458), Čeče – 8 (521), Dobovec – 9 (463), Franc Fakin – 67 (3534), Franc Salamon – 19 (569), Fric Keršič – 50 (2785), Ivan Keše – 60 (2560), Klek – 20 (615) and Zasavje – 15 (566).

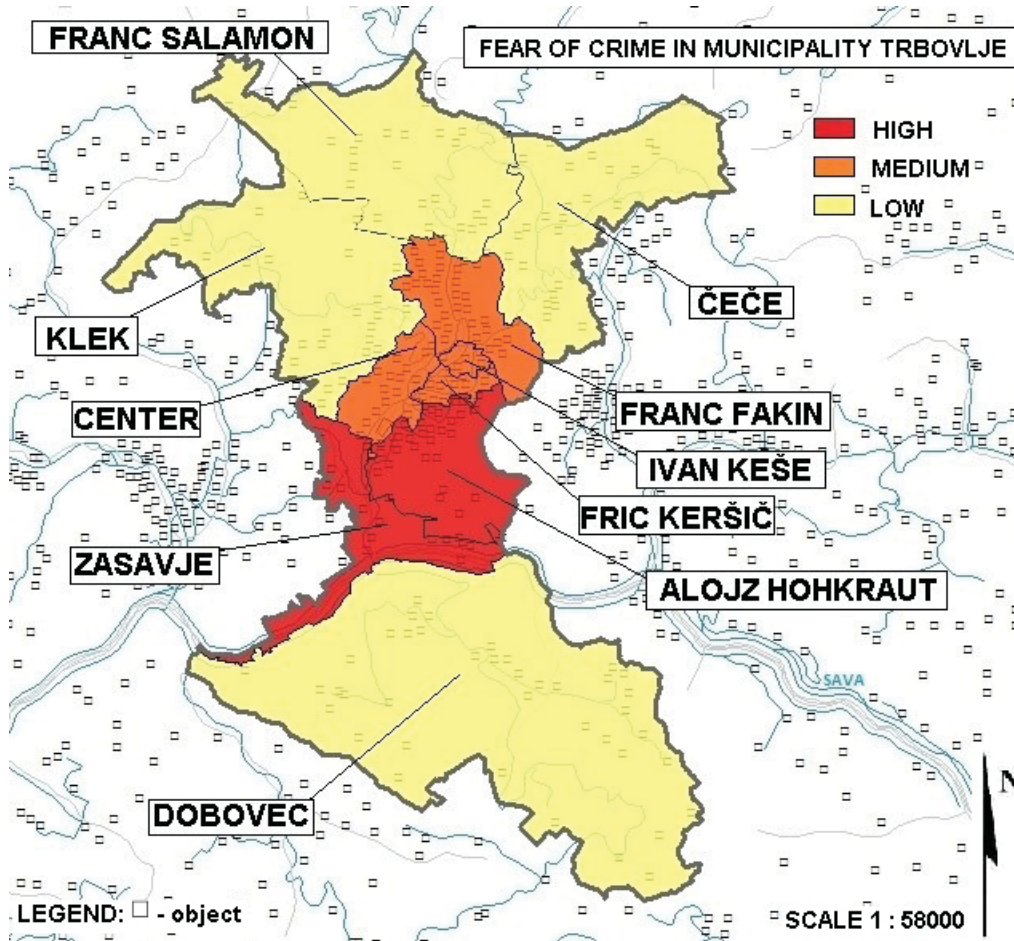


Figure 2: The fear of crime in the area of local communities in the municipality of Trbovlje in 2013

The intensity of the fear of crime is illustrated by different colours:

- 1) red - high fear of crime (mean level of fear of crime committed value is over 2.0000);
- 2) orange - medium fear of crime (mean level of fear of crime committed value between 1.9000 to 2.0000); and
- 3) yellow - low fear of crime (mean level of fear of crime committed values between 1.6000 to 1.8999).

## DISCUSSION

The analysis of the collected data and obtained results were presented in the form of map, which represents the level of fear in the area of local communities in municipality of Trbovlje.

The findings suggest that in the local communities on the outskirts of the municipality (e.g. Čeče, Dobovec, Franc Salamon and Klek) the presence of fear of crime is smaller than in local communities located closer to the city centre. Thus higher presence of fear of crime in local communities where the crime rate was higher (e.g. Alojz Hohkraut, Center, Ivan Keše and Zasavje) was identified. The highest levels of fear of crime were detected in two local communities: Alojz Hohkraut and Zasavje. In both local communities it is possible to detect different signs of physical and social disorder, as in these local community deteriorated residential buildings and abandoned buildings, mainly in the form of abandoned factories and abandoned warehouses are prevailing. At the same time in these local communities blocks built in the socialist era, which does not allow a transparency over the entrance into the block and where anti-burglar devices are not installed, are something usual. The discriminant analysis showed that the indexes, which were asking for collateral property in the population (the average value of the index: 2.3000) and the likely consequences of victimization (the average value of the index: 2.7100), distinguish the most between fear of crime. Furthermore, the index of past victimization (the overall value of the index: 1.0746) and site security at night (overall average of the index: 1.2607) distinguish the least between fear of crime of the inhabitants of local communities in the municipality Trbovlje. On the question, which location in Trbovlje respondents considered as the most dangerous, 29.7% respondents answered that no location seems dangerous to them, 12.6% respondents identified a city park as the most dangerous location in the city, followed by forests (11.1%) and bars (9.4%). In addition, the results showed that 72 % of the respondents believe that the city is safe at night and that they would dare to go alone anywhere at night, while 6.5 % of respondents considered the city park as a location where they would not dare to be or go alone at night.

It has to be noted that this is a pilot study on mapping the fear of crime, with a sample of only 350 respondents, thus it is the first such study in the Republic of Slovenia, since all previous surveys focused only on the measurement of fear of crime or on crime mapping of selected crimes.

## CONCLUSION

The results of the study in the municipality of Trbovlje showed that the higher crime rate coincides with an increased level of fear of crime. The use of graphical presentation of the distribution of fear of crime revealed that level of fear of crime is smaller in the border local communities, which are not so heavily urbanised and have lower number of inhabitants compared to local communities located closer to the city centre. In continuation, findings revealed that gender as a factor has really small impact on fear of crime in the municipality. The factors property insurance and consequences of victimization have the highest impact on the differentiation of fear of crime between individual local communities. The rate of property insurance in the local communities, where the highest level of fear of crime was detected, is relatively high. The identified local communities present the area, where residents with lower social status, who cannot afford the loss, destruction or damage of their property, are located. The consequences of the possible victimization is the index, which has a strong impact on the distinction between the groups, indicating that the residents of the local communities, where higher standard of living is present, much easier continue with their lives, if they had been victims of robbery or theft. All respondent groups have in common that residents would have difficulties to normally continue with their lives if they had been victims of any form of physical attack. Finally, made maps of crime and fear of crime distribution in Trbovlje represent a good starting point for further exploration of fear of crime mapping and planning of further work of police in the municipality of Trbovlje. A greater emphasis should be focused on formal social control and community policing, which would help to reduce the fear of crime in local communities. Additional in-depth studies would enable the analysis of the distribution of crime for a longer time period and greater focus on neighbourhoods rather than on the local community. The repetition of the study on a larger sample would provide greater validity of the results.

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## CRIME INTELLIGENCE AND CRIME ANALYSIS

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**Abstract:** It is a fact that the organized crime represents a significant problem for almost every country in the world, so the international community has undertaken a number of serious steps in confronting this phenomenon. Considering the fact that crime today is manifested through a vast array of different types of crime and that it is very difficult to control it because of its amazing flexibility in a certain area, the police work should be more proactive in the future. In order to come to achieving that goal, the need for criminal intelligence work should be based on gathering relevant operational information and evidence. This kind of work requires high-quality database, work with operational links, powerful and top-notch analysts, as well as adequate decision-making in time-appropriate situations.

**Keywords:** collecting data, analysis, criminal intelligence, organized crime

### INTRODUCTION

It is no exaggeration to say that the greater part of organised crime at the end of the twentieth and early twenty-first century is transnational in character, while the formal reactions directed towards its control often remained at national levels. Many studies on organised crime, especially in the US, continued to treat organised crime as a domestic problem, often focusing on the local manifestation rather than recognizing that transnational activities have become dominant form of functioning of many criminal organizations.<sup>1</sup>

The earliest references to intelligence-led policing originate with the policing in the UK and the period of early nineties of the last century, which saw an increase in crime rate, which could not be clamped down by traditional reactive model of policing whose essence means, registration and disclosure of the crime, police involvement, opening the process of criminal investigation, criminal legal processing and co-operation of the police, office of the prosecutor and the judiciary. Due to rising crime in early nineties public pressure appeared. The police was expected to do something different, which would be more effective and cost-efficient at the same time which would lead to faster reduction in crime rate, in other words a trend of “new public management” appeared with the aim to increase effectiveness. The police were losing the battle on the streets, and public confidence with it.<sup>2</sup> A review of the strategy of policing that followed through Audit Commission for Police effectiveness report in 1993 (landmark report), led to a review of the methodological focus that was standard for the reactive police work, and it was the specific accent on criminal offenses rather than on its perpetrators.<sup>3</sup>

The UK National Intelligence Model sets tasking priorities for intelligence-led policing more clearly on the base of four key aspects:

- 1) targeting offenders; especially the targeting of active criminals through overt and covert means;
- 2) the management of crime and disorder hotspots;

<sup>1</sup> Williams, P., Vlassis D. (2001), *Combating Transnational Crime – concepts, activities, and responses*, Frank Cass, p.40.

<sup>2</sup> Ratcliffe, J. H. (2003), *Intelligence-led Policing, Trends and Issues in Crime and Criminal Justice*, no 248, Australian Institute of Criminology, Canberra, p.2.

<sup>3</sup> Heaton, R. (2009), *Intelligence-Led Policing and Volume Crime Reduction*, *Policing Advance Access*, p.45.

- 3) the investigation of linked series of crimes and incidents; and
- 4) the application of preventative measures, including working with local partnerships to reduce crime and disorder.<sup>4</sup>

When we talk about criminal intelligence work we have to point out to the fact that the essence of action is aimed at secret data collection. Which means that detectives who deal with intelligence work should not undertake real operational tactical measures and actions, i.e. their work should be inconspicuous, i.e. with distance in relation to criminal actions of actors. The role of a detective who secretly collects operational information is to observe and monitor events, reach adequate conclusions, strategically plans and learns through practical and theoretical work. In this way the work of a detective who acts inconspicuously remains unnoticed and in this way he fulfils the role of criminal intelligence.

At issue is a very complex system that proceeds from several important premises: 1) Police managers (managers) at all levels (starting from the local, and to national) should have high-quality data, or a good informational starting point for the quality of the decision-making with regard to the engagement of police resources and resolving tasks; (b) It takes to form a system for collecting raw data, then data analysis in order to form a new value of the information, as well as the delivery of processed information to those managers whom they may be of importance for decision-making; c) a good technical basis for putting the system in work in practice represent a sophisticated computer database, computer software for the analysis and opportunities for the verification of the data.<sup>5</sup>

In the last decade of the twentieth century, the concept of reactive approach to the crime was abandoned in the world and proactive crime-fighting strategies started to be developed which means a systematic and coherent analysing of criminality in whole or certain types of it. Police activity of crime-fighting focuses not only towards actual criminal phenomena, but also the conditions and the causes which lead to crime.<sup>6</sup>

Strategic criminal intelligence work is focused on the future events and deals with predicting possible models of behaviour and trends. In the domain of prevention, criminal intelligence functions within so-called secondary soft, indirect prevention, which is a typical predictive approach. Predictive approach means that the intelligence and analytical activity are primarily concentrated on predicting future criminal activities and attempts to prevent them, rather than responding to the current criminal offenses and carrying out standard police work, which is mainly task of the local police forces. The goal of strategic criminal intelligence is to provide an assessment based on current projections and new risks and threats which crime generates. This assessment is produced in the form of a review of criminal resources, threats, trends and intentions, in accordance with organizational strategic goals and principles. Strategic criminal intelligence work provides data that allow for long-term vision of the context and problems that are relevant for policing.<sup>7</sup>

In the literature it is said that, criminal intelligence based on intelligence information (intelligence-led policing) is a business model and managerial philosophy where data analysis and crime intelligence are pivotal to an objective, decision-making framework that facilitates crime and problem reduction, disruption and prevention through both strategic management and effective enforcement strategies that target prolific and serious offenders.<sup>8</sup>

## CRIMINAL INTELLIGENCE

The concept of intelligence-led policing underpins the basis of effectiveness, from neighbourhood policing and partnership work to the investigation of serious and organised crime. Intelligence work, the effective and efficient collection, recording, dissemination and retention of information allows for the identification of material which can be assessed for intelligence value and enables decision making about priorities and tactical options. Where information has been derived from human sources, additional risks and considerations arise about the management of such sources and obtained information. It is, therefore, very important

4 Ratcliffe, op.cit.p.3.

5 Simonović, B., Mitrović, D. (2010), Saradnja u okviru kriminalističkog obaveštajnog rada, Međunarodna i nacionalna saradnja i koordinacija u suprotstavljanju kriminalitetu, Banja Luka, p.199.

6 Simonović, B.(2011), "Strateški pristup kriminalističke policije u kontroli kriminala: međunarodni propisi, pojmovno određenje, neki izazovi implementacije" zbornik radova Kriminalističko forenzička istraživanja, Banja Luka, p.74.

7 Fatić, A, Korać, S, Bulatović, A, (2013), Etika kriminalističko-obaveštajnog rada, Institut za međunarodnu politiku i privredu, Beograd, p.149.

8 Gottschalk, P. (2010), Policing Organized Crime, Intelligence Strategy Implementation, CRC, New York, p.44.

that staff understands the role that they play in the intelligence-led policing process, and how they can achieve the best results through knowledge of the following key aspects.<sup>9</sup>

Criminal Intelligence work is not a revolutionary novelty in crime work, but it can certainly contribute to more efficient crime fighting at operational and also strategic level. Its implementation into investigative practice requires changes in the police management and police culture. Criminal intelligence work is the police (investigative) activity and philosophy, which underlines processes of collecting, analysing and evaluation of data interesting to police (especially from criminal area) with the intent of more efficient suppression of crime at all levels. It requires high-quality data base and the competent thinkers with a full knowledge of the police crime-combating field.<sup>10</sup>

In criminal intelligence work however, we come across expressions like intelligence process and the intelligence cycle.

Intelligence process consists of gathering, evaluation, collation, and analysis and data presentation. All of these activities require planning. Today there is a completely different approach in the work and evaluation information and data. While in the past methods were ad hoc, today police in their work uses plans for data collection (United Nations Office on Drugs Crime). Unlike the intelligence process, intelligence cycle is composed of several phases of which some are completely identical. In addition to collecting (the gathering of data), evaluation, collation, analyses and presentations (which contains intelligence process) intelligence cycle contains phases such as: tasking, data integration and inference development.

In order to better understand this process it is necessary to make a clear distinction between basic terms that are used in the intelligence work (United Nations Office on Drugs Crime):

**Information:** “knowledge in raw form”.

**Intelligence:**

-” information that is capable of being understood”;

-“information with added value”;

-”information that has been evaluated in context to its source and reliability “.

**Analysis** (of either information or intelligence):

-“the resolving or separating of a thing into its component parts”;

-” inventory elements determining intelligence research-ascertainment of those parts”

-”the tracing of things to their source to discover the general principles behind them”;

-“a table or statement of the results of this process”

The most complex phase is the analysis, which includes assessment and what analysed data mean for the further development of events. It creates additional value of analytical information, because it is expected of them not only to give intelligence information, but also possible final solution. This demands full knowledge of the analysts in the field of preventive and repressive act in the area of crime-fighting<sup>11</sup>.

Therefore, the essence of criminal intelligence data is in fact conversion of data into “intelligence” or intelligence information. Intelligence information allows those who decide, solve law enforcement investigative problems to choose best solutions. Criminal intelligence becomes a synonym for the new model of policing: intelligence-led police, or intelligence-led police (Intelligence Led-Policing).<sup>12</sup>

Intelligence analyst asks a question at the very beginning: which meaning information has and whether it can be proved. Model of an effective and rational investigation is based on use of analytical information. Analysis is used for reaching conclusions by using facts, or more precisely, facts are given meaning, quality which is necessary for the proving procedure. By linking the fact collected in the course of the investigation analytical product is created, and it is used for coming to conclusions that represent a new information, which until then has not been known. It may be a new lead in the case, the version on the suspect, the identification of crime hot spots, the priorities of policing or the strategy for preventing crime.

<sup>9</sup> Practice Advice Introduction to Intelligence-led Policing, 2007, Produced on behalf of the Association of Chief Police Officers by the National Centre for Policing Excellence, p.3.

<sup>10</sup> Dvoršek, A. (2009), Kriminalistički obaveštajni rad i njegove perspective u kriminalistici, Pravo i Forenzika u Kriminalistici, Kragujevac, p.154.

<sup>11</sup> Ibid

<sup>12</sup> Ibid

## CRIME ANALYSIS

Although in today's conditions of development of information technology it is usually assumed that it is simple to compile data on crime which has certain state authorities, unfortunately in practice this is not the case. The fact that data on crime do not collect only judicial bodies, but also, many other state bodies and non-governmental entities, and in the end, even individuals makes it difficult to develop a single data base on criminal phenomenon, and, which is the most important thing, makes it difficult when it comes to drafting of data base about which measures are effective and under which conditions, and which are not.<sup>13</sup>

Nick Tilly and Gil Dando emphasize that in the process of the gathering of information during criminal intelligence accent is on: offenders, networks of perpetrators, with the aim to inform a policy of "smart repression" that is directed to models with frequent perpetration or serious criminal offenses. Analysis in criminal intelligence work is naturally aimed at current or recent models of perpetration of criminal offenses. Intelligence material that can be obtained often comes from sources from criminal environment. The collection is often secret. Criminal intelligence work leaves almost no space for the analysis of security problems which are not criminal in nature.<sup>14</sup>

Analysis of the committed crime should include criminological and crime aspect. Criminological aspect includes data analysis of the personality and social environment and punishing victims (damaged), total population, economic and other relevant community specifics for forecasting of crime. Criminalistics aspect includes data analysis of treatment tactics of the perpetrator of criminal offenses (before, during, after the execution of it), behaviour of victims, characteristics of places, the time and resources used in the execution. It is the information in connection with golden issues of criminalistics.<sup>15</sup>

Crime analysis is systematic, analytical process which studies crime characteristics, methods of work and models of police organization with the aim to ensure timely relevant information necessary for managing proactive and reactive activities and the models of police organization. Rachel Boba defines crime analysis as a systematic study, problems of delinquency as well as other data important for police work, including socio-demographic, spatial and temporal factors, with the aim to provide assistance in apprehending criminals, reducing crime and delinquency, prevention of crime and evaluation of the police work and organizational procedures.<sup>16</sup>

Organization of society's reaction to crime is directly conditioned by knowledge of its main features. The main way to identify the characteristics of crime is the use of methods of analysis. By sticking to these rules a large number of police organizations are trying to organize their work by using the results of the analysis of crime as much as possible. One of the parameters that indicates this is the number of analysis software that is introduced into the work of the police, and also the place they occupy in the plans of various countries to improve policing. In this way a greater functional efficiency of the police, and therefore the security level is raised to a higher level, which is the primary goal of every police. In countries where there has been an increase in the efficiency of policing, the efficiency is directly linked to the high level of scientific development process of crime analysis.<sup>17</sup>

The subject of analysis is carefully, systematic testing and information study about crime, methods of work and the ways of police organization. Procedure of analysis defines ways of collecting, processing, classification, identification and use of information obtained in this way. Analysis includes specific analytical methods, statistical techniques and computer software as a necessary support for storage, analysis, and use of the obtained information.<sup>18</sup>

The subject of analysis are both qualitative and quantitative information. A special subject of analysis are data used in the procedure of proving criminal offenses, including data relating to socio-demographic components, spatial and temporal characteristics of offenses. The subject of

13 Vuković, S. (2010), *Prevenција kriminala*, Kriminalističko policijska akademija, Beograd, p.54.

14 Tilly&Dando, 2012, according to Fatic, Korac, Bulatovic, op.cit.p171.

15 Vuković, op.cit.p58.

16 Rachel, B.(2005), *Crime analysis and crime mapping*, SAGE Publications, Inc, p.5.

17 Đurđević, Z. (2007), "Pojam i vrste analize kriminaliteta", *Nauka Bezbednost Policija*, Kriminalističko policijska akademija, br.1, p.110.

18 Đurđević, Z., Radović, N. (2012), *Kriminalistička operativa*, Kriminalističko policijska akademija, Beograd, p.141.

analysis is determined by the type of analysis. Depending on this fact the subject of the analysis can be identification form of criminal conduct or even prediction of individual criminal conduct, trends and forms of crimes in a certain space, including vulnerability of certain goods protected by criminal law.

Procedure of crime analysis, as a scientific methods, consists of five phases: data collection, processing, classification, analysis of collected data, presentation and analysis feedback.<sup>19</sup> Results of the crime analysis are often conditioned by the procedure of the analysis. Errors made in one stage may not be removed in the next, but the procedure of the analyses has to go back at the beginning. Incorrectly entered data needed for a given analysis can often be the problem of the analysis. This fact is becoming a well-known only in a process of analysis. When this happens the analysis is returning to the start and ways of processing and classification have to be changed. Such a procedure is called sub-cycle of modification of the data.

### TYPES OF CRIME ANALYSIS

Crime analysis is practical disciplines used by police. Boba R., depending on the purpose, the types of data, primary goal analysis and used analytical techniques decides in<sup>20</sup>:

- 1) Intelligence Analysis
- 2) Criminal Investigative Analysis
- 3) Tactical Crime Analysis
- 4) Strategic Crime Analysis
- 5) Administrative Crime Analysis

**Intelligence Analysis.** The subject intelligence analysis is the identification of network organised criminal groups and their members with the aim to provide police assistance in arresting them, defining borders of future investigations (Petersen). The subject of intelligence analyses are also information related to financial management, family and business ties, movement and links between persons in organised criminal groups. The above information are the result of policing, research, special exhibits respectively actions and operational knowledge. Thus obtained data are evaluated, linked with each other and in defined way presented to organizational unit of the police that they work within. Quality of intelligence analysis depends on the quality of co-operation intelligence analysts and other organizational units of the regional police.

**Criminal Investigative Analysis.** This analysis makes the point process of the development "profile" punishing criminal offenses, including immediate zone of his residence or work, as well as geographical profiling. The process of offender profiling Holmes and Holmes (2006) based on four assumptions: 1) the crime scene reflects the personality of the offender; 2) it is assumed the modus operandi will remain the same from crime to crime; 3) the offender's signature will remain unchanged; 4) offender profiling assumes the offender will not change their personality. These four main assumptions implicitly suggest a direct link between characteristics of the crime and personal characteristics of an offender.<sup>21</sup>

**Tactical Crime Analysis.** Tactical analysis means a study of the criminal offenses and possible criminal activity through a review of the features, such as: the way, the time and the place where the criminal offenses were committed as a support to registration of their appearance forms, developing recommendations for investigations, identifying suspects and evidence of offenses.<sup>22</sup> The goals of tactical crime analysis are 1) linking cases together and identifying the notable characteristics of the patterns and trends, 2) identifying potential suspects of a crime or crime pattern, and 3) clearing cases. During the investigations detectives usually do not have enough time for analysing of solved cases. Linking a particular way of committing crime with the already registered offender provides assistance for detectives when trying to create a version of an event about the offender of the newly discovered criminal offense.<sup>23</sup>

The base of tactical crime analysis represent quantitative and qualitative data whose sources are different types of police reports. The best among quantitative data are: type of criminal offense,

<sup>19</sup> Rachel, op.cit.p.38.

<sup>20</sup> Ibid

<sup>21</sup> Holmes M.R.-Holmes T.S. (2002). *Profiling violent crime*. Thousand Oaks-et.all.: Sage Publications, 2002.

<sup>22</sup> Rachel, op.cit.p.13.

<sup>23</sup> Djurdjević&Radović, op.cit.p.147.



the date, time, a day in a week, the place, the manner of execution, the data about the offender (age, education, employment, gender, etc.). Qualitative data consists of the specific feature that separates one criminal offense from the others (the sentence which the offender speaks aloud when committing a criminal offense).

#### **Strategic Crime Analysis**

Strategic planning of law enforcement activities is a global approach and within it specific types of crime are analysed (as well as criminality as a whole), conditions and causes which produce them, certain types of criminals and the existing measures as well as its control and suppression, in order to notice general regularity, tendencies in the crime, as well as individual form and systemic weaknesses in the organization and conducting crime activities with the aim of eliminating, finding new preventive solutions, increasing the efficiency suppression, detection and proof of the offenses.<sup>24</sup>

The subject of strategic crime analysis is a study of the problems and the way of police response to it with a view to define the framework of policing in a longer time period. The two primary purposes of strategic crime analysis are 1) to assist in the identification and analysis of long-term problems and 2) to conduct studies to investigate or evaluate relevant responses and procedures as police responsibility and the functionality of the organization.<sup>25</sup> The subject of strategic crime analysis includes analysis of the rate of crime offences, becoming a victim again, determining the critical hot spots and environmental characteristics that may affect the execution of the crime.

The Ministry of Internal Affairs of the Republic of Serbia has issued „Strategy Development Ministry of the Interior from 2011 to 2016. Year”. The great importance strategy suggests Simonovic: one should not wait for the changes to happen. We must not allow them to surprise us: we must not wait for them unprepared. Changes should be predicted, anticipated, have prepared solutions for what is now going on, or what will happen to us in possible future. Logical way of thinking in this new age requires different approach.

**Administrative Crime Analysis.** The primary focus of administrative crime analysis is the decision of what and how to present information about the results of crime offences in order to inform the police institutions, representatives of the government and citizens. Administrative crime analysis is different from the previous types of analysis in that it refers to presentation of findings rather than to statistical analysis or research. The primary purpose of administrative crime analysis is to inform audiences and select important information that can be interesting to a certain part of audience. Often, the type of information that is presented represents the “tip of the iceberg” of all the work and analysis that has previously been done.

## **CONCLUSION**

In contemporary social conditions there is an expansion of various forms of organized crime, where reactive policing methods do not provide adequate fighting against its manifestations. Similarly, in the last few decades, police forces of certain countries have established new models of combating organized crime, in order to act proactively and among them the one that sticks out is the model of criminal intelligence whose purpose is to secretly collect and analyse data on criminal offenders, to control critical hot spots and to undertake preventative measures. This model of the functioning of police services has proven to be very effective, especially in countries where it has been developed: in England, America and Australia. The essence of criminal intelligence is conversion of the collected raw information into information that are considered to be accurate, and it is also the production of intelligence products, such as strategic and tactical assessment, the profile of the case and the profile of the subject. Without adequate, timely and accurately determined data it is impossible to make a timely and quality decisions by a criminalist who takes the necessary criminalistics measures and actions in order to prevent and fight crime. Criminal intelligence today is largely based on the work of operational links and connections, appropriate databases, where a significant role is played by the analysts as well as support of new software devices.

<sup>24</sup> Simonović, op.cit.p.75.

<sup>25</sup> Ratchel,op.cit.p.16.

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## MONEY LAUNDERING BROUGHT THE INSURANCE SECTOR

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**Abstract:** The market conditions and the competition between the financial institutions - insurance companies - increasingly expanded their business by introducing new services and tools and became financial conglomerates with diverse investment alternatives. Globally, the insurance sector occupies a significant place in the financial system because it emerges as a manager of pension funds, investment funds, holders, etc. Comparative analysis of the insurance sector worldwide shows that the insurance companies are a relatively small sector with a high share of foreign capital. From the statistic data it is evident that the insurance market, despite the negative effects of the global economic crisis, has a tendency of increasing insurance premiums for about 10.6%. A share of the value of insurance premiums to GDP shows the importance of the insurance sector in the total economic activity in a country. Rising of the insurance sector leads to a wider opportunity of its abuse. According to some world researches, 80 million dollars are laundered through the insurance sector. In this paper we will present the most frequent ways of laundering through the insurance sector and we will mention some measures for prevention from abuse of the policy norms for money-laundering purposes and further paths and directions of how to improve protection from using the insurance sector by the launders.

**Keywords:** financial institutions, insurance companies, premium, money laundering, due diligence

### INTRODUCTION

The insurance sector has a significant place in the global financial system. It is also a big driving force in the economy of the highly developed countries. Comparative analyses of the insurance sector worldwide indicate that the insurance companies are relatively small sectors with a high share of foreign capital. The insurance industry is one of the biggest financial industries and offers a large number of complex products.

The banking sector is the primary medium for money laundering; yet, other modes are also used through the financial system. Because of the vast number of products offered by the insurance companies, this sector gives plenty of possibilities for money laundering using various sophisticated techniques and most frequently, the insurance companies are not aware that they are being used in the purpose of transforming the illegal financial means into legal. According to some sources, the worldwide insurance industry generates premiums in the range of USD 2.4 to 2.6 trillion.<sup>1</sup> Statistical data in the USA indicate that nearly 80 million dollars are laundered through the insurance companies and over 200 insurance policies were purchased from drug traffickers. According to the analyses of Schneider, apart from the money laundering through the banking sector, in 64% of the analyzed cases the insurance sector was also included.

This paper is divided into four parts, apart from the introduction and the conclusion. The first part elaborates the phenomenon and the phases of money laundering through the insurance sector. The second part presents the typologies of money laundering through the insurance, which are set by FATF. The weaknesses of the insurance industry to money laundering are elaborated in the third part, and the fourth part is dedicated to the state of money laundering through the insurance in the Republic of Macedonia.

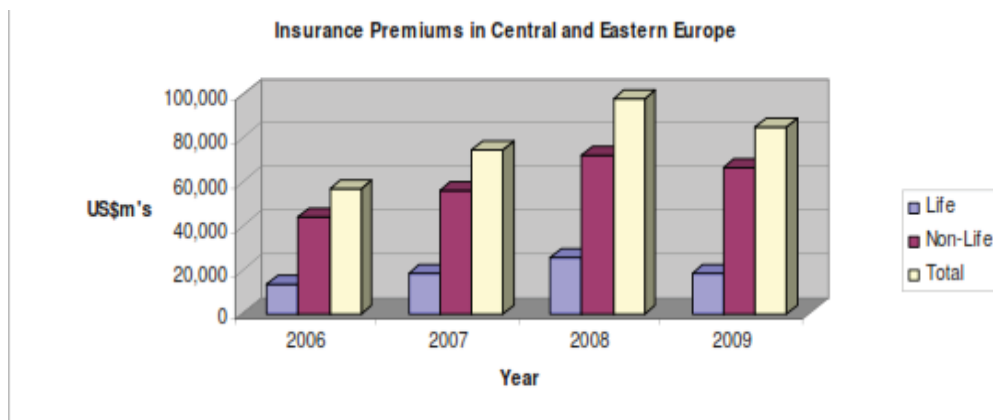
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<sup>1</sup> OECD (2003), Insurance Statistics Yearbook 1994 - 2001, p. 2; and "Sigma Insurance Research Paper 8", World Insurance in 2002, p. 26.

## MONEY LAUNDERING THROUGH THE INSURANCE SECTOR IN THE WORLD

The insurance sector together with the banking sector and the capital market take a significant place in the financial system at a global level. The development of the financial system contributes to development of the utilized instruments as well as the ways and methods of payment. With this, criminals also find various ways of utilization of instruments and methods of money laundering. Researches show that the insurance sector is least vulnerable to money laundering; yet, there are many risks, and modes of protection of the insurance sector from money laundering must be sought. Thus, insurance sector must be provided with adequate measures in prevention from its abuse by money launders or terrorists, and possible cases of money laundering or financing of terrorism must be resolved. In this sense, insurance companies are exposed to legal, operational and reputational risks.<sup>2</sup>

The insurance sector is a relatively new sector in a number of MONEYVAL countries and is still in the process of building up a range of products. As a result of this, the sector has experienced a growth of 49% from 2006 to 2009 in certain states. As a result of the downturn in the global economy, there was a reduction in insurance premiums in some states in 2009 with life premiums reduced by 30% in 2009 and non-life reduced by 8%. The insurance sector in certain states has continued to develop in spite of the stagnation in growth in some developed economies. Overall, in the period from 2006 to 2009, global insurance premiums grew by only 11% (in contrast to 49% in the respondent states). The other significant tendency is that, whereas on a global level life insurance accounts for 58% of all premiums on average, in the responding states life insurance accounts for only 24% of the premiums.<sup>3</sup>



*Diagram 1. Insurance Premiums in Central and Eastern Europe*

Source: MONEYVAL Insurance Typology Questionnaire

<sup>2</sup> [http://www.aso.mk/dokumenti/soopstenija/publikacii/priracnik\\_za\\_sprecuvanje\\_na\\_perenje\\_pari.pdf](http://www.aso.mk/dokumenti/soopstenija/publikacii/priracnik_za_sprecuvanje_na_perenje_pari.pdf)

<sup>3</sup> Committee of experts on the evaluation of anti-money laundering measures and financing of terrorism, MONEYVAL, 33rd Plenary Meeting (Strasbourg, 27 September - 1 October 2010)

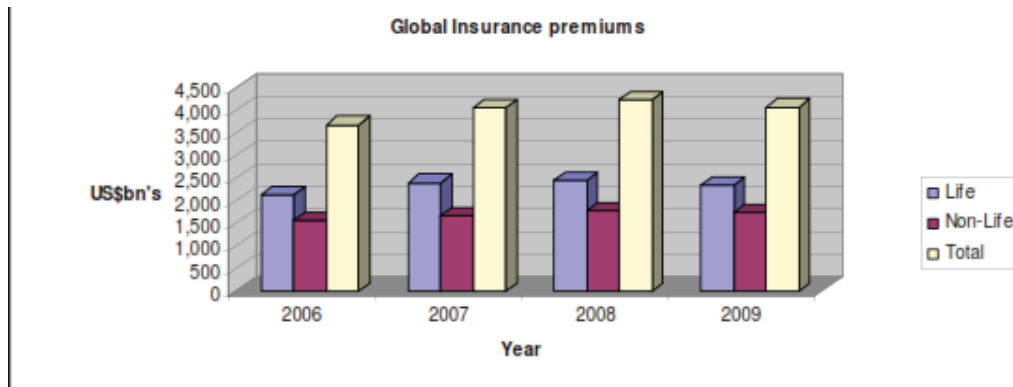


Diagram 2. Global Insurance premiums

Source: MONEYVAL Insurance Typology Questionnaire

Money laundering through the insurance sector starts with investment of money, i.e. purchasing of insurance policies with the help of mediators for insuring known as brokers.

According to FATF, the phases of money laundering through the insurance sector are:

#### Placement

This stage involves introduction of illicit funds into the financial system, with an intention to conceal the true origin of funds and to avoid attracting scrutiny. Illegal proceeds are introduced into the financial system in terms of a cash deposit into a financial institution or a lump sum purchase of a life insurance product (e.g. an annuity product or a purchase of monetary instruments such as money orders or drafts). A successful placement typically involves a good alternate explanation of the source of the cash deposit and / or a method to split large amounts into smaller deposits.

#### Layering

This is the second stage, which follows after the illegal funds have been successfully introduced into the financial system. In this phase, the launderer engages in a series of conversions or movements of the funds to distance them from their source<sup>4</sup>. This is the stage in which life insurance companies are most vulnerable, as most life insurance companies do not receive payment and accept cash as a form of premium payment. In order that the illegal funds are successfully laundered in the life industry, the launderer might simply make deposits at any financial institution and wire the funds through a series of accounts at various banks across the globe, to the life insurance company for premium payment or purchase of an annuity or a life insurance product. Thus, they create a complex layer of financial transactions to mask the true origin of funds. Successful layering typically involves the anonymity of the originator for each of the transfers, structuring payments through secrecy jurisdictions or through anonymously held corporations.

#### Integration

This is the third stage of the money laundering process and entails placing the laundered proceeds back into the economy to create the perception of legitimacy<sup>5</sup>. The launderer might choose to invest the funds into real estate, luxury assets, or business ventures.<sup>6</sup> In the case of insurance, money launderers can purchase an annuity product by way of a cheque or an electronic

4 The Financial Action Task Force (FATF):

[http://www.oecd.org/document/29/0,3343,fr\\_32250379\\_32235720\\_33659613\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/29/0,3343,fr_32250379_32235720_33659613_1_1_1_1,00.html)

5 Association of Certified Anti-Money Laundering Specialists (ACAMS) June 2004 Preparation guide for the certification Examination

6 The Financial Action Task Force (FATF):

[http://www.oecd.org/document/29/0,3343,fr\\_32250379\\_32235720\\_33659613\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/29/0,3343,fr_32250379_32235720_33659613_1_1_1_1,00.html)



funds transfer. They take advantage of the 10 day free look period (a period where you can pull out of the contract and obtain a refund based on contract terms) and obtain a refund. In this way they get a cheque from a reputable company, the fund is successfully laundered and is extremely difficult at this stage to distinguish between legal and illegal funds. Like placement, successful integration depends on an alternate and apparently legitimate explanation for the source of funds, e.g. lottery winnings<sup>7</sup>.

## **TYOLOGIES OF MONEY LAUNDERING THROUGH INSURANCE SECTOR**

FATF has elaborated three reports for typologies in the insurance sector in order to detect money laundering through the insurance sector.

FATF recognizes the following typologies:

### **Life insurance**

Deposits on the part of third parties and premature purchase of policies

Policies which are used as collateral in loans

### **Premature purchase**

Collusion with the insurance company

### **Nonlife insurance**

Premiums which are too big

Premature cancellation of the insurance policy

### **Insurance companies, and**

Reinsurance

### **Life insurance**

Life insurance is the product most frequently used by the criminals in the transformation of the illegal into legal assets. This type of insurance covers a wide spectrum of policies with refunding of damage to products which are actually savings and investment products with elements of compensation for damages. The life insurance products with savings and / or investment elements have integrated purchasing value and some products can provide premature purchasing. This alternative gives a possibility for money laundering and is the most frequently used method of money laundering. Some countries have a "cooling off" period which provides an entire compensation of the initial payment within a certain time period stated in the policy itself. This provision has been introduced for protection of the investors, but is also most often used by the launders. The brokers or the insurance companies must always be aware of whether the clients have economic rationality of the policies that are being purchased. Not having economic sustainability implies to suspicious transactions.

### **Deposits on the part of third parties and premature purchase of policies**

The second most frequently use typology which belongs to the part of life insurance is the utilization of deposits on the part of third parties and premature purchase of policies. This typology refers to situations where third parties pay for policies on the name of other persons, and are not logically related. Also, this typology refers to situations when we have premature purchasing of the policy or the policy is sold to third persons.

#### **Policies which are used as collateral in loans**

The policies for life insurance with savings or investments have a basic value and are used by the launders as collateral for loans through premature purchase of the policy, and thus the loan is repaid.

<sup>7</sup> Chioma Ihekwoaba - Ufodike, Money Laundering and the Life Insurance Industry: The Role of the IFA, Research Project for Emerging Issues / Advanced Topics Course, Diploma in Investigative and Forensic Accounting Program, University of Toronto, 2008

**Premature purchase**

This type of typology is the most attractive to the money launders because it is very difficult to prove the justification of the premature purchase. Such are the examples of transformation of the personal state or increase of the expenses of the insured party.

**Collusion with the insurance company**

In most of the cases of money laundering, the insurance company is used without being aware, but there also exist some insurance companies which collaborate with money launders, especially with the purpose to avoid paying of taxes to the state.

**Nonlife insurance**

The most utilized typologies for money laundering are through life insurance, but there are also cases where the nonlife insurance is utilized for money laundering.

**Premiums which are too big**

The use of premiums which are too big requires collaboration of the insured party and the insuring agent. In this type of fraud, the Carousel scheme is used through fictional enterprises which do not possess assets and disappear right after the insured event takes place.

**Premature cancellation of the insurance policy**

Nonlife policies differ from life policies in not having internal value, but yet as a typology they can be utilized when the policy is cancelled prematurely with compensation of part of the premium.

**Insurance companies**

The insurance companies have an important role in the capital market, because they invest the surplus of the funds in securities. They can be used in money laundering or be engaged in money laundering without overtaking any insurance transaction. But, when they invest financial means on the capital market in other countries, they are obliged by international standards and laws to report on such cases in order to avoid money laundering.

**Reinsurance**

Reinsurance is one of the typologies for money laundering when the insurer transmits the means away from the domestic market.

**WEAKNESSES OF THE INSURANCE COMPANIES**

According to MONEYVAL we can determine certain general characteristics of the insurance industry, which make it vulnerable to money laundering, and especially:

**Lack of awareness.** There is a general lack of awareness in the insurance industry that the insuring products may be attractive to the criminals as means for money laundering. Because of this, it is very important that the brokers, the regulating agencies and the providers of law recognize the threats and work in direction of improvement and up-to-dating of the international regulations for money laundering through the insurance sector.

**The failure to identify the transactions of money laundering.** This lack of awareness implies that the cases of money laundering are often neglected. The failure to identify the suspicious transactions is due to several factors, such as:

Insufficient sharing of information about money laundering in the insurance sector;

General lack of supervision for prevention from money laundering, especially in the sectors of insurance and reinsurance;

The international character of the market for reinsurance makes the awareness of all the aspects of the transactions more difficult;

Vulnerability of the insurance sector to advanced (layered) phases of money laundering.

**Focus on claims fraud.** Although detection and prevention of claims fraud is essential for the insurance companies, this is frequently perceived as being the only crime threat to insurers.

In practice, money launderers make use of insurance transactions mostly before the claims are made (e.g. through early redemption, refunds, etc.).

**Savings and investment features.** Many life insurance and pension products have saving and investment elements; this means that the products concerned have an underlying intrinsic value, which means that they can be either deposited as collateral for loans or redeemed at an early date generating funds from an apparently legitimate source. Many of the vulnerabilities on these products are similar to those identified in the FATF typology report on Money Laundering and Terrorist Financing in the Securities Sector.

**Cash deposits.** Many countries are seeking to encourage savings schemes within the aging population, including life insurance and pension products. It is a feature of such schemes that cash payments are frequently accepted as payments of premium or contributions. This is particularly the case in countries where cash is still the primary medium for making small or regular payments.

**Use of intermediaries.** Many insurance companies place their products on the market through independent intermediaries.<sup>8</sup>

### THE STATE OF MONEY LAUNDERING IN THE REPUBLIC OF MACEDONIA

In accordance to the world practice in the insurance, in the Macedonian Legislation the Insurance is divided into two basic types:

life insurance (insurance of life, rental, additional insurance with insurance of life, a free-will pension insurance, etc.), and

nonlife insurance (insurance of consequences from accidents, vehicle insurance, **KACKO** insurance, property insurance, insurance from fires and other dangers, insurance of responsibility, etc.)

All types of insurance, according to the Macedonian legislation, are divided into 23 classes (Article 5 from the Law of Supervision of the Insuring - 27/2002).<sup>9</sup>

The whole insurance system in the Republic of Macedonia is legally based on the Law of Supervision of the Insuring (Official Gazette of the Republic of Macedonia - 27/2002), as well as other separate laws, subordinate laws and implementation of the legislation of EU in the branch of insurance.

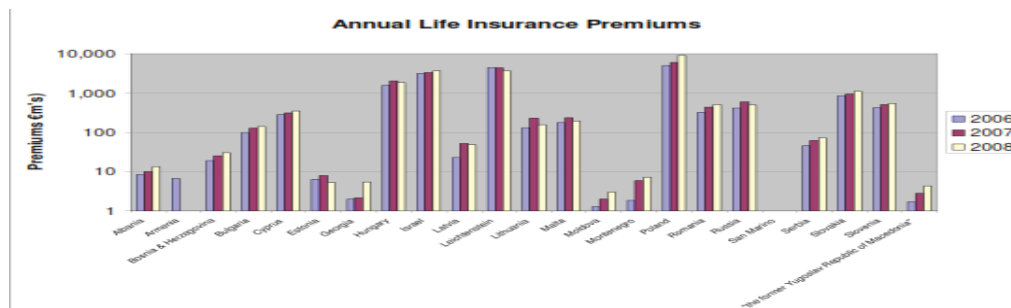


Diagram 3. Annual Life insurance premiums of MONEYVAL member countries by dollars (2006 to 2009)

Source: MONEYVAL Insurance Typology Questionnaire

<sup>8</sup> Committee of experts on the evaluation of anti-money laundering measures and the financing of terrorism, MONEYVAL, 33rd Plenary Meeting (Strasbourg, 27 September - 1 October 2010)

<sup>9</sup> Law of Supervision of the Insurance, Official Gazette of the Republic of Macedonia 27/2002

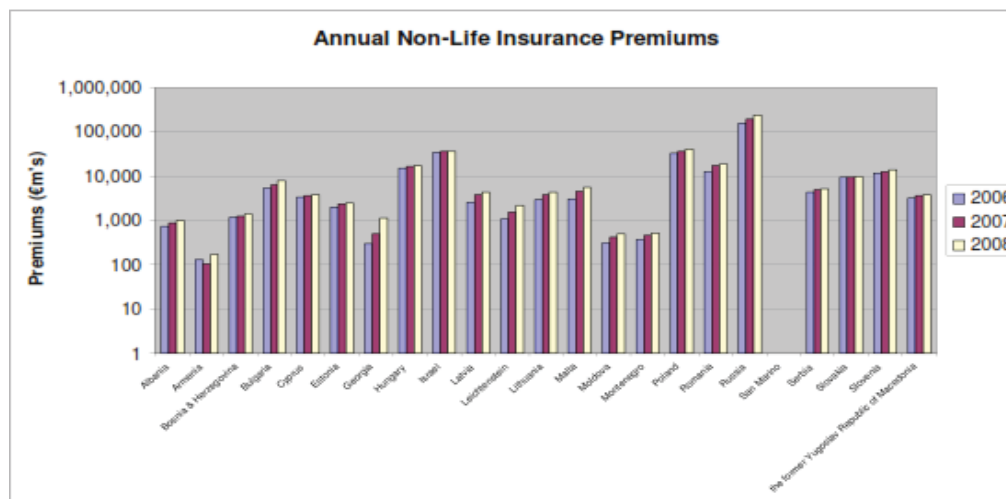


Diagram 4. Annual Non-life insurance premiums of MONEVAL member countries by euros (2006 to 2008)

Source: MONEYVAL Insurance Typology Questionnaire

According to the value of the premiums of life and nonlife insurance, Republic of Macedonia belongs to the countries with a growth in the insurance sector.

The participation of the insurance sector in the total financial structure is 3,7% in 2010. In 2009, 13 insurance companies existed in Macedonia, 12 broker insurance companies and 5 companies for representation in the insurance process, while in 2010 the number of these institutions increased to 14 (3 for life and 11 for non-life insurance), 14 and 6 respectively. The growing tendency of the insurance sector is evident in its increased participation of 1,8% in GDP in 2008 to 2,9% in GDP in 2010. The degree of penetration in the Republic of Macedonia was 1,5%, as well as in Romania 1,5%, in Turkey 1,3%, in Greece 2,1%, in Bulgaria 2,5%, in Croatia 2,8%, etc. The degree of density at the end of 2010 was 3149 MKD (51 euro) gross of the premium by policy per capita, which demonstrates the low level of insurance culture in the Republic of Macedonia. Compared to the countries in the region, the degree of density of the insurance sector in the Republic of Macedonia is at the lowest level. This indicates to a great potential for growth and development of the financial system.<sup>10</sup>

The insufficient interaction between the banks and the insurance companies as two main segments of the financial system (according to the amount of the assets), ensures limited transfer of the potential risks from one segment into the other, and at the same time presenting inspiring factor for strengthening of the type of services offered by the financial system. For illustration, only 0,1% from the gross premiums from policy of the insurance sector were gathered through three banks - entirely in the part of non-life insurance - and in 2010 the banks did not pose insurance on the approved loans in the insurance companies (in 2009 only two banks posed insurance on loans). The invested deposits in the banks were 11,1% from the total assets of the insurance companies. On the other side, they participated only by 0,6% (0,7% in 2009) in the total deposits of the banking sector. This confirms the dependence of these non-deposit financial institutions on the banking system rather than the other way round.

At the end of 2010, the assets of the insurance companies increased by 316 million MKD (2,6%) and achieved the sum of 12.519 million MKD. In contrast to 2009, in 2010 this sector noticed a gain of 75 million MKD of which 57,6% are in the gain of the companies for life insur-

<sup>10</sup> NBRM (7 - 2011) - Report of Financial Stability of Republic of Macedonia for 2010, NBRM, (07, 2011)

ance. Advancement was also noticed in the increase of the premiums from 428.394,00 billion MKD in 2003 to 648.622,00 billion MKD in 2010.<sup>11</sup>

The main regulation state instance controlling the overall market of Insurance in the Republic of Macedonia is the Agency for Supervision of Insurance (ASO).<sup>12</sup>

	2009	2010	2011	2012
Entities engaged by the Law to undertake actions to prevent money laundering and financing of terrorism.	/	Insurance companies 14 Broker insurance companies 14 Companies for representing in the insurance 6	Insurance companies 4 Broker insurance companies 17 Companies for representing in the insurance 5	4
STR <sup>1</sup> submitted to the Direction	0	0	0	0
Data of contracted policies of insurance of 15.000 euro or more, in MKD	/	162	163	180

*Table 1. Position of the insurance companies as entities charged by the Law to undertake actions to prevent money laundering and financing of terrorism (from 2009 to 2012)*

Source: Annual reports from Office of Financial Intelligence, by the author

According to the Annual Reports of the Direction for financial intelligence (Table 1) we can see that none of the insurance companies has submitted report on suspicious transaction to the Direction. We can also notice that the number of contracted policies on 15.000 euro is growing. According to FATF, there are several indicators that point to suspicious transactions. If an insurer suspects, or has reasonable grounds to suspect that funds are the proceeds of a criminal activity or are related to terrorist financing, it should be required to report its suspicions promptly to the FIU. An important precondition of recognition of a suspicious transaction is for the insurer to have sufficient information about the customer and business relationship to recognize that a transaction, or a series of transactions, is suspicious.

Suspicious transactions might fall into one or more of the following categories:

Any unusual financial activity of the customers in the context of their own usual activities;

Any unusual transaction in the course of some usual financial activity;

Any unusually linked transaction;

Any unusual or disadvantageous early redemption of an insurance policy;

Any unusual employment of an intermediary in the course of some usual transaction or financial activity e.g. payment of claims or high commission to an unusual intermediary;

Any unusual method of payment;

Any involvement of any person subject to international sanctions.

<sup>11</sup> State Statistical Office - Statistical Annual of the Republic of Macedonia for 2010, SSO, 2011

<sup>12</sup> ASO - Register of Insuring Companies

Verification, once begun, should be pursued either to a conclusion or to the point of refusal. If a prospective policyholder does not pursue an application, it may be considered suspicious. Insurers, their directors, officers and employees should not disclose the fact that a suspicious transaction report or related information is being reported, or has been reported, to the FIU. The insurer should be aware that if it performs additional CDD because of suspicions it could unintentionally tip off the policyholder, beneficiary or other subjects of the suspicious transaction report. The insurer could then decide not to pursue such policies due diligence activities but to file a suspicious transaction report<sup>13</sup>.

## RECOMMENDATIONS

In the Republic of Macedonia, the awareness of the problem of money laundering has not been sufficiently developed, yet. Even though the recommendations of FATF were successfully implemented, the fact that not a single STR was reported by the insurance companies indicates that money laundering has still not been recognized as a problem in the Republic of Macedonia. Another fact is also important: the payments for the premiums of the insurance companies take place through the banking sector, and hence the banks report on these as STR to the Direction of financial intelligence. The Direction of financial intelligence does not possess statistical information on how many of the reported STRs were submitted to the insurance companies through the banks. Future recommendations must be directed toward increasing of the awareness about the problem of money laundering through the insurance sector. Trainings on the part of the Direction for all employees engaged in the insuring part must also be increased. According to MONEYVAL only one case of training in 2009 and one in 2010 for one insurance company were organized. Further directions are: improvement of the analyses in order to provide a better perception on how many or which of the STRs in numbers and amounts are part of the insurance sector; increase of the control of the Agency for Supervision of the insurance, etc. According to the reports from 2009 and 2010, two supervising controls within the insurance companies took place.

## CONCLUSION

The insurance sector has a significant place in the global financial system. It is also a big driving force in the economy of the highly developed countries. The insurance industry is one of the biggest financial industries and offers a large number of complex products.

Because of the vast number of products offered by the insurance companies, this sector gives plenty of possibilities for money laundering using various sophisticated techniques and most frequently, the insurance companies are not aware that they are being used in the purpose of transforming the illegal financial means into legal.

In the Republic of Macedonia, the awareness of the problem of money laundering has not been sufficiently developed, yet. Even though the recommendations of FATF were successfully implemented, the fact that not a single STR was reported by the insurance companies indicates that money laundering has still not been recognized as a problem in the Republic of Macedonia. Of great importance is the overtaking of preventive measures in the combating of money laundering through the insurance sector.

The efficient scrutiny, greater control, the guideline “know your customer” and its prompt implication are some of the preventive measures for combating money laundering through the insurance sector. Also, the improvement of the international collaboration, the exchange of information, following the novelties in the insurance types as complex mechanisms contribute to improvement of the measures for combating money laundering in the insurance sector.

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14 1 STR - Suspicious transactions



## GRAY ECONOMY IN SERBIA AT THE THRESHOLD OF THE THIRD MILLENNIUM STATUS AND PROGNOSSES

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**Abstract:** With a high degree of certainty we can conclude that the gray economy is a multidimensional area, multi-layered phenomenon, and its dimensions and characteristics can be very different from the relatively benign smuggling to particularly economically destructive phenomena. By this term we must assume illegal activity in the area of undeclared economy, individuals, groups or organizations aimed at obtaining economic benefit which causes financial damage primarily to the state.

From our past bitter experience of economic development of the Republic of Serbia, it can be concluded that the gray economy is not a phenomenon of peripheral importance, and is only a marginal companion to legal economy, but in addition to unemployment and corruption is the biggest problem of the domestic economy on the eve of the new millennium. For these reasons, the gray economy is still undesirable, illegal and economically destructive phenomenon, because it has the power to drain off a big part of social wealth, which prevents positive changes in economic and other aspects of development.

After the democratic changes in the year 2000, and expressed enthusiasm for the process of European integration, it is expected that the volume of gray economy be reduced to a tolerable measure. In the new circumstances, there is a change in the relative size and nature of the gray economy, and we cannot overlook the fact that it is a symptom of weak institutions.

During this process it is necessary to continuously examine the character, determine the future perception of the development of this destructive phenomenon and propose wide-coordinate research projects, which would include economists, lawyers, psychologists, and even criminologists.

**Keywords:** gray economy, economic destruction, crime, informal interaction

### INTRODUCTION

Monitoring and studying parallel, informal, hidden economic relations in domestic economy continues to attract unabated attention of economists, lawyers, sociologists, criminologists and scholars from other social sciences, which try to determine its main characteristics, causes, and to quantify its size and socio - economic consequences.

The gray economy is not a marginal phenomenon. Addressing the above issues in our conditions is carried out under the strong influence of important, and often negative, social changes we are going through. Arguably one of the most widespread forms of economic destruction and financial indiscipline in the Republic of Serbia is to avoiding to pay taxes that are public revenue such as excise and sales tax on goods and services, customs, different types of taxes, fees and other fiscal obligations. The above mentioned forms of destruction are observed from the perspective of our country and of our experience. The projected goal is to draw attention to our current specifics, tradition and all the other factors that create a favorable climate for the development of new forms of gray economy. The process of transition in which we find ourselves is not the cause of any form of dual economy, rather than just the ability to get it faster and easier to develop and extend functionality.

Parallel economy problem attracts attention of the scientific and lay public for at least two reasons<sup>1</sup>:

- Firstly, parallel economy scale is growing
- Secondly, there exists the belief that without revealing the secret of informal economic relations the mechanism of functioning of the legal economy cannot be adequately built

Crime is becoming more organized, and the forms of the gray economy more subtle, while sources of this phenomenon are intertwined and difficult to clearly delineate. Regardless of that, the gray economy appears as the base that feeds the economic torts. To understand the phenomenon it should be isolated and defined.

### DETERMINING THE GRAY ECONOMY

Parallel or dual economy as a phenomenon and the term in the literature first appears in the early seventies of the last century. Like most negative phenomena at first it is mostly negated, and the opinion of the transient nature of the phenomenon is prevalent. The eighties bring a degenerative shift and change of attitude, considering that the planned economic growth has not resulted in the expected reduction of unemployment and the conversion of the dual economy to the formal.

In most of the scientific and professional presentations the term gray economy is far better known and more frequently used. Without going into the semantic aspect of the title, we retain it as an appropriate term for a particular form of negative activities that will be discussed.<sup>2</sup> In both professional and lay public numerous definitions of the informal economy can be detected. During the process of defining a number of concerns and views of the authors is present.

The gray economy (aka "hidden economy", "shadow economy", "informal economy"), is a global phenomenon, to a lesser or greater extent, present in all countries, regardless of the type of society and the level of socio - economic development inherent in the underdeveloped and developed countries, but the economic development reduces its share in GDP.

United Nations Development Program defines informal economy as: economic activities, assets and transactions, often illegal, which are not registered or otherwise reported to the appropriate state authorities, thus avoiding taxation, sometimes described using synonyms such as "shadow", "underground" or "gray economy".

There are several definitions of the informal economy in the Russian scientific literature. Dr Svetlana Glinkin construes the gray economy as the totality of economic activities that do not involve official statistics and are not included in the gross national product of the country.<sup>3</sup> Of course, activities bordering on true crime operations cannot be considered as offenses with a positive sign.

The gray economy is defined as the set of all legal market production activities that are deliberately concealed from public authorities for one or more reasons: to avoid corporate income tax, value added tax or other taxes, in order to avoid certain legal standards that apply to the market, and/or in order to avoid certain administrative procedures, such as the filling of statistical surveys or administrative forms.<sup>4</sup>

According to a more complete definition, the gray economy comprises economic activities and the income created by performing them that circumvent or otherwise avoid regulations, taxation or monitoring by the relevant authorities and government.<sup>5</sup>

According to the Dictionary of Economics economy is a set of economic activities that take place outside of institutionalized economic environment. It includes criminal business, fictitious economic activities, the informal economy and other covert and not legalized business transactions.<sup>6</sup>

From the tax standpoint the gray economy is the value of taxable activities and rights for which tax has not been paid, and which are taxable under the law. Tax evasion is the margin between the taxes that the taxpayer is required to pay under the current regulations and submission of tax returns.

1 Milena Vučićević "Osobnosti neformalne ekonomije u ruskoj federaciji", Belgrade, 2005, p. 319

2 Vera Pilić, „Ekonomija u senci“, Ekonomski anali, 1991, No. 108, Belgrade, 1991, p.131.

3 Svetlana Glinkina, „Теневая экономика в современной России“, Слободная мысль, No. 36, 1995, p. 26.

4 A critical review of different assessments and methods of quantification can be found in Schneider's studies (2005 and 2010).

5 Milena Vujović et al. „Dostojanstven rad i siva ekonomija“, Fondacija Centar za demokratizaciju, Belgrade, 2013, p. 5.

6 University of Belgrade, Faculty of Economics, quotation, p.715.

The term “gray economy” appears in the official state documents of our country. The official document of the Government of the Republic of Serbia is called “Gray Economy and Measures for Its Suppression.” Even the Government of Federal Republic of Yugoslavia under the program to combat the gray economy gave the following definition of the term in 1998. “Gray economy is an activity which, through lack of legal norms and operations outside of legal flows aims to avoid the prescribed fiscal and other obligations to the state.”

It is difficult to find a precise definition of this phenomenon, since there is no agreement on its forms. The conclusion is that the gray economy is a complex and still not scientifically treated economic phenomenon, which is reflected in a number of different concepts related to its definition, as well as in the existence of several names for this unique phenomenon. Given the relatively short period in which the gray economy is seriously studied and the great variety of forms, it can be said that this state of affairs is not unexpected.

### BASIC CAUSES AND FORMS OF GRAY ECONOMY IN TRANSITION PERIOD

As a form of illegal and uncontrolled economy founded outside the norms prescribed by law, this phenomenon most often results in criminal business, fictitious economy, and concealed and not legalized business transactions often closely linked to other forms of economic crime. According to the stated above, it can be said that the gray economy is manifested most strongly in the transition from one social status to another or in the process of transition, and its expansion is always a symptom of major disruptions in economic development. Although a phenomenon which varies from country to country, the scientific community is still, to some extent, uniform with respect to the cause of its occurrence, generator, and the effects that it has within the national economy.

There is an extensive literature on the possible causes of the informal economy, but the most often stated factors are: 1 Economic, 2 Psychological and 3 Opportunity factors

- High tax burdens, financial problems, severity of sanctions, and the expected profit are stated as economic factors
- Having no confidence in the state, disagreeing with the economic policy, and attitude towards risk are emphasized as psychological factors
- The factors of opportunity are education and work experience in carrying out economic activities outside the legislative

The socio-economic situation in Serbia is such that it favors the high level of informal economy. Our country is in transition for a long time, having a low rate of economic growth, the rule of law is low, and the enforcement of the law is weak. When you add a tolerant attitude of the citizens towards the gray economy, it is not surprising that the gray economy in Serbia amounted to 30.1% of gross domestic product in 2010.

TABLE 1. The order of the most significant causes of the gray economy, depending on the degree of development of the country

Developing countries	1. Burden of state regulation 2. Rate of unemployment 3. GDP per capita
Countries in transition	1 Direct taxes and social security payments 2 Rate of unemployment 3 indirect taxes
Highly developed OSCE countries	1 Direct taxes and social security payments 2 Tax morale 3 The quality of state institutions

Source: Schneider, 2006: 17



The causes of the informal economy are manifold. The prevailing opinion is that the main cause of this phenomenon is motivated by violating regulations that result in full or partial tax evasion. The enormous cost pressures on businesses causes that they enter into a zone of tax evasion and non-payment of taxes on income and VAT, trying in this way to reduce cost pressure. The mere fact that paying taxes is a burden and cost to the taxpayer leads him to resort to anything to lessen their tax burden. Therefore it is not surprising that the percentage of revenue collected by force is much larger than the tax revenues that go into the state budget voluntarily. In economic terminology, all modes and ways to avoid paying tax obligations are denoted as the concept of tax evasion.<sup>7</sup>

As one of the significant causes of the gray economy is the level of unemployment. At the beginning of 2013, the unemployment rate in Serbia reached a record of 29.53%. In the circumstances of low economic growth, poor investment climate and prolonged effects of the economic crisis, the informal sector becomes an alternative to the formal escaping the poverty line, which actually multiplies poverty in the long run.

TABLE 2 Indicators of the labor market and informal employment in Serbia, 2006-2012

	2006	2007	2008	2009	2010	2011	2012
Rate of participation	63.6	63.4	62.7	60.6	59.0	59.9	59.7
Rate of employment	49.8	51.5	53.7	50.4	47.2	45.3	44.2
Rate of unemployment	21.6	18.8	14.4	16.9	20.0	24.4	26.1
Informal employment (as % of total employment of the adult population 15 +)	---	---	23.0	20.6	19.6	17.8	17.0

Source: Labor Force Survey, National Statistical Office

Not ignoring the fact that we are still in the process of changes in the economic and ownership structure, which initially inevitably leads to a slight rise in unemployment during 2014, as announced by the relevant department ministers, it is reasonable to expect further growth in the gray economy. Although the gray economy remains an important social category for many in Serbia, its negative effects on employees, businesses and the economy as a whole, far exceed its benefits.

As an accompanying cause a low morale level is stated. Tax morale is defined as the willingness of taxpayers to settle their tax obligations received by the state in full and on time, and it also exerts a substantial influence on the level of the gray economy. In countries where the level of trust in state institutions, their fairness and efficiency is lower, the level of tax morale is low, which negatively influences the rate of gray economy. The high tolerance of gray economy by the state also affects the low level of tax morale.<sup>8</sup>

Institutional factors, the rule of law and poor functioning of public authorities (judicial, inspection, tax, police, budget inspection) are also a key cause of the expansion of the gray economy. One must not ignore the poor the institutional capacity and inter-agency coordination, which is not at a desirable level. Certainly, untimely tax collection significantly facilitates the expansion of the dual economy. Order of tax administration from 2012 that banks take control of payment collection represents a unique demonstration of the inability of the Tax Administration of Serbia.

It is often pointed out that the shadow economy exists in the administrative and normative system, but it is in the market conditions that it assumes galloping development and its exchange and volume are significantly different from those in the previous system. Through its pulsations in the naive forms, the shadow economy leads to modern forms of expression that become a cause of constantly increasing crime with the characteristics of the gray economy.<sup>9</sup>

<sup>7</sup> Word evasion comes from the Latin verb *evadere* meaning: escape, evade, run away.

<sup>8</sup> Moral attitudes of tax evasion justification depend on numerous factors such as tradition, the behavior of other taxpayers, the existence of privileged taxpayers, the degree of tolerance by the state, the quality of public services, and others.

<sup>9</sup> Goran Bošković: *Uzroci i pojavni oblici sive ekonomije*, Belgrade, 2009, p. 570

The last national study on the gray economy in the Federal Republic of Yugoslavia - Serbia with recommendations was made as far back as in 1998. The size of the gray economy is estimated then to 34.5 % of the registered GDP. No doubt that there is a change in the relative size, character, and new forms of informal economy in the year 2000.

It is assumed that one of the most common forms that taxpayers in the country currently use to reduce their obligation is the common practice of performing a variety of business - financial transactions tax-free in this way avoiding the taxes that are most important to the state. Thus, sales tax paying used to be avoided earlier, and now VAT paying is avoided.

Abuses are often manifested through the payment of goods and services for cash, which is not recorded in the business records, nor is the money paid into the bank account of the company. Instead, out of the book dinar and foreign currency treasuries are formed. The safe harbor of such businesses, primarily is the "flea markets" that are flooded with Chinese goods without any papers, and there is a large number of vendors in that transport goods with no known origin all around Serbia through various channels. This goods is mainly imported from neighboring countries. In Pancevo, Subotica, Belgrade and other places there are open markets "flea markets" that sell huge amounts of uncleared goods and in which sellers do not pay VAT. Smuggling again becomes one of the most lucrative jobs in the region.<sup>10</sup>

Transition and privatization are full of criminal scandals that have a court epilogue especially during the year 2013. This situation allows the original "accumulation" of criminal profits and leaves a large number of the workers to fend for themselves and seek livelihood by "moonlighting". When it comes to the aforementioned aspect of the gray economy, it faces less severe public criticism though those in power claim that it is socially unacceptable, and is the cause of rising unemployment and social injustice. Estimates of the number of people who are working illegally in Serbia are worrying. According to the findings of inspection bodies the informal economy usually recruits young unskilled workers, workers with middle level of education, the employed with no regular wages, the unemployed over 40 years of age, and the recipients of cash benefits and social assistance.<sup>11</sup>

Research within the framework of the project "Towards a More Efficient Suppression of Informal Work and the Informal Economy" suggests that the gray economy includes the rich multinational companies so as to avoid taxes and other expenses, as well as small businesses not able to meet the requirements of doing business in the formal economy. This modern form works in the way that it forms a flexible and specialized production units, some of which remain informal and unregistered and thereby employ a growing number of non-standard workers in different places scattered in different locations and in different countries. These part-time workers and those who are not as a rule employed in the gray zone, but through flexible forms of work such as temporary and part-time jobs, are the so-called "leasing staff".<sup>12</sup> Leasing staff are workers hired through agencies that mediate employment. The agencies they rent them to other companies and act as their employer. A rented worker has no contract with the company in which they are engaged, which means that the company has no obligation to them.

The potential for tax avoidance also exists in the case of the income of property. Illegal building construction is another important indicator that the construction business is a generator of the informal economy. The exact number of illegally constructed buildings in Serbia is yet to be determined. In Belgrade only, more than 170,000 buildings without planning permission are identified and listed, as it is about in the whole territory of Vojvodina. The existence of a large number of buildings that are not taxed is a clear message that the government tolerates the gray economy.<sup>13</sup>

New contemporary forms of gray economy are created almost openly over the Internet, ads placed in newspapers and other things that would be relatively easy to prevent, but it is not done due to inertia. On this occasion we will present some of the websites where they promote and implement this method of selling: Limundo, Kupindo, as well as many internet sites abroad.

10 During 2013, the retail sales decreases by 30.4% compared with the 2008, yet in Subotica, Apatin, Sombor, Kikinda and Horgos smuggling flourishes like the one from the nineties.

11 R.Ristanović, "Dostojanstven rad u Republici Srbiji – postavljanje jednakosti i solidarnosti u središte evrointegracija", Fondacija Centar za demokratiju, Belgrade, 2011.

12 OMV Retail, parts of NIS and others work by this principle.

13 Based on the assessment of employees in the Tax Administration about 15% of apartments in buildings and office buildings is not taxed, while the percentage in the case of houses exceeds 20%, see: Arsic, M. and Randjelovic, S. (2012).

Economic offenses that occur in classic or modern forms of the gray economy are multiplying especially in periods of transition and crisis. They are an indicator of the criminalization of the economy.

### PROSPECTING THIS PHENOMENON FURTHER DEVELOPMENT

The informal economy is a current problem of the Serbian economy. The goal of each state is to clarify the causes and mechanisms of the gray economy and to review its most important consequences that on the basis of clear theoretical positions as well as empirical and statistical material. By doing so, the further prospecting development of this negative phenomenon will be determined, and based on these findings an effective, long-term strategy of confronting this state of affairs must be defined.

In the early nineties, the gray economy becomes an acceptable coping mechanism for business and household, in response to multiple shocks to which they are exposed. Although the current overall economic conditions are substantially different and better, compared to those in the last decade of the last century, and the gray economy does not show signs of major spills from its comfortable riverbed, at present it presents a multiple challenge to economic policy makers. Specific features of the development of the informal economy in our country are quite visible, and to what degree and extent they will become criminalized in the future depends on the criminalization of consistent implementation of strategies for combating it.<sup>14</sup> Studies in our country on gray economy are not sufficiently reliable, do not involve sufficient criteria and therefore should not lightly be at grade. On the other hand, it is just an illusion to expect that the involvement of the gray economy can offset the budget deficit.<sup>15</sup>

The existence of so-called budget state is a very important fact of tax evasion. Proliferation of government spending comes into conflict with the savings, investment and employment. The recent practice of VAT invoiced on a gratuitous implementation is a new redistributive scheme of a large tunneling out of the economy into the account of the state, even in the circumstances of the death agony of the economy. The epilogue of this situation leads to a situation where the ability of the government to manage the national economy is undermined. If the budget is a priority and the tax policy is oriented towards filling the budget rather than the expansion of economic activity, the end result is the informal economy as a method of defense against attacks by the state budget, which in the future would certainly open the black scenario and further criminalization of economic relations.

The poorest are the least likely to move from the gray into the regular economy for their income from the informal economy serves to preserve their existence, because they do not acquire wealth in this way. Through job creation, a stronger economic growth can shift a large part of the poor into the regular economy. In view of the presence of the gray economy in Republic Serbia, our country is no exception compared to other countries, but what distinguishes Serbia from most countries is a big number and a large percentage of the population engaged in the informal sector relative to the total working-age population, and the prospects are that this trend will maintain.

In order to achieve the desired scope of government spending, tax authorities will react in such a way that the tax losses due to the growth of the informal economy are compensated for by increased tax rates, which is confirmed by the recent actions of the Government of the Republic of Serbia while some measures are in legal procedures or in the public debate. This will result in an additional burden on the part of the population that pays taxes, thus increasing their costs and reducing competitiveness. At the micro level, the gray economy creates large disparities in the burden of taxpayers prejudice to the principle of burden according to the taxpayer's income. In this way, the gray economy prevents the conduct of proper economic policy.<sup>16</sup>

14 Report on the gray economy in Serbia „Novi nalazi i preporuke za reformu“ Fond za razvoj ekonomske nauke, Belgrade, 2013.

15 If we compare the current crisis in Greece, where almost a third of the economy in the gray area, i.e. about 30% of taxpayers do not pay taxes, it is clear that this is a big problem that threatens the entire economic system of our country, because many elements of the Greek crisis are recognized in Serbia

16 Dragana Bešlić, Ivana Bešlić, „Siva ekonomija u Srbiji“ Belgrade, p. 38

The need for in-depth understanding of the informal economy and finding measures for its reduction through formalization becomes acute. In such conditions, it is more visible that the gray economy can be not only a consequence but also a cause of further reduction of the gross domestic product and the deepening crisis. Therefore, the main goal is designing a strategy and making recommendations to encourage the formalization of the informal economy in order to enhance the competitiveness of the Serbian economy and contribute to economic development. Prospecting for further development of the phenomenon points to the conclusion that it is a long but rational and the only possible way for the consolidation of our economy which should not develop any further as a milieu suitable for different forms of the informal economy. According to the estimation of experts, Serbia will take three to five years to reduce the level of gray zone at least at the regional level.

### MEASURES AND INSTRUMENTS FOR SUPPRESSING THE INFORMAL ECONOMY

Every country has an obligation to confront the forms of shadow economy in accordance with its capabilities, and bearing in mind its legislation, its provisions and penalties ensuing the identification of the event and entities who take part in it i.e. who are involved in the practice of the informal economy. As in many other areas of economic life, systematic research of this phenomenon is still inefficient. The general opinion of the experts is that the state has not yet a strategic approach to finding solutions for the problems of the gray economy. The integration process, the economic crisis and high unemployment contribute to such state of affairs.

There are many measures that can be taken to suppress the gray economy and they can be classified into three groups: 1 preventive, 2 stimulating and 3 penalties

**Preventive measures** include measures aimed at the development of social consciousness:

- It is essential to increase awareness of the negative effects of the gray economy through the education system and the media and thus influence the increase of tax morale.
- Media campaigns should clearly indicate the risks and costs of participation in the gray economy<sup>17</sup>
- Adequate and credible media coverage of the gray economy
- Greater involvement of the scientific community in the research of this phenomenon and the implementation of realistic and accurate studies in order to identify the motives for participation in a hidden area of economy.

Most authors put emphasis on preventive measures. It is clear that the carriers of preventive measures have to be the Serbian Government, local government, trade unions, employers and employees.

**Incentives** include:

- In this regard, the most important measures of fiscal policy to suppress the gray economy are reducing the distrustive effect of the tax system and reducing the cost-effectiveness of tax evasion, as well as reducing the tolerance to the informal economy.
- Many authors believe that this phenomenon should not be suppressed, but the ways should be found to integrate it in the formal economy, as it is done in the economic practices of the Republic of China and the Republic of India.
- Creating a conducive environment to remit payment of tax, for business and employment in the formal sector.
- Improving the efficiency of state institutions.
- Decrease in cash payments and non-cash incentive payments.

**Penalties**, include:

- Avoiding the payment of taxes violates the legal provisions and their violation brings about punishable, unlawful, prohibited conduct. In severe cases, evasion and breach of these obligations escalate to tax crime for which the offender is imposed a prison sentence or a fine and security measures by the court. Among the offenses the following are distinguished by their

<sup>17</sup> "Take the Receipt" is the best known campaign led in Republic Serbia towards the end of 2004. There is also the campaign being led in Montenegro under the name „VAT is Your Money“

importance: tax evasion, illicit trafficking, and smuggling as basic offenses in modern criminal law, which significantly impact the obtaining of correct indicators of the gray economy.

TABLE 3 Structure and number of offences pertaining to the gray economy

Year	Tax evasion	Smuggling	Illicit trafficking	Illicit production
2007	223	274	277	7
2008.	273	253	284	11
2009.	294	403	197	8
2010	421	368	287	7
2011.	275	205	240	10
2012.	352	127	271	10

Source: Republic Serbia Ministry of Interior

- Uniformity of penal policy stipulated in the tackle, with all other laws governing this area  
 - Also in the formulation of measures primarily to insist on the implementation of existing laws, as the adoption of new laws without creating the conditions for their implementation does not affect the reduction of gray economy.

Institutional and regulatory framework in which business is conducted in Serbia is not ideal but the fact is that it defines mandatory legal business. High level of gray economy in our circumstances shows that the rule of law is not working effectively. Government institutions do not uphold the law consistently or they do it selectively.

TABLE 4 Summary of overall results of “moonlighting” inspection in the territory of Republic of Serbia in the period 2007-2011.

Year	Total number of inspections	Number of persons inspected	Number of persons found “moonlighting”
2007.	48.255	268.682	10.448
2008.	42.595	306.416	9.054
2009.	40.222	357.498	5.734
2010.	37.747	558.536	5.228
2011.	33.920	503.613	5.744

Source: Report on the Activities of the Labor Inspectorate for the year 2011.

The process of translating the gray economy into the legal taxable flows should start from the following assumptions:

- The level of the gray economy that secures the survival of socially vulnerable population
- The level of the gray economy that emerges as a product of inefficient institutional control

The reform of inspection work in Serbia is one of the main parts of the regulatory reforms for the year 2014, which must be incorporated in the development strategy and strategy of suppressing the gray economy, and bring about an action plan with concrete measures to be taken to follow the strategy. The Government of the Republic of Serbia announces that the reforms of the inspection services begin before the adoption of the umbrella law on inspections.

## CONCLUSION

To the best of our abilities, in this paper we try to at least briefly highlight the new forms, causes and prospection of further development of the gray economy in Serbia at the beginning of the new millennium. In times of crisis of national history and existence, economic destructions such as the gray economy in the diversity of their forms are inevitable, only their intensity and causes vary from country to country.



From the economic, legal and criminological standpoints, which are the core of this analysis, the informal economy represents the entire relationship between the individual and institutional entities in connection with the production, distribution and exchange. The symptoms of a genuine cooperation and planning are undoubtedly present in the underground economy while we must not forget that the system of criminal relations also feeds the gray economy. Systemic struggle must begin by addressing key structural problems in the economy and the state. The more successful the actions against other forms of economic crime are (corruption, abuse, fraud, trafficking, abuse of intellectual property rights, money laundering), the more successful the fight against tax evasion will be.

Therefore, combating the gray economy calls for the creation of an atmosphere in the society in which this economy is viewed as a real evil, which requires the existence of clear coordinates of conducting state policy. All these issues demand for a long time a clear articulation of the measures of economic policy and social consensus.

The goal is not to eliminate the informal economy because it is practically impossible, but to reduce it to the European level. Hence the conclusion that all that is good and recognized in the informal economy of a country should be legalized as soon and as fully as possible. The negative effects of the gray economy are debated enough in the paper.

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## CYBER WARFARE AS A LATENT FORM OF AGGRESSION

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**Abstract:** The crime of aggression is defined at the First Review Conference of the Rome Statute in the International Criminal Court in Kampala in June 2010, when states parties adopted both, the report given by the conference working group for criminal act of aggression, and the resolution of adopting the amendments those amend the Statute. In the same resolution, the Conference adopted amendments to the Elements of the crimes related to criminal act of aggression. The consideration of the cyber warfare requires complex and multidisciplinary approach and development of new, original and efficient principles and norms in the construction of national and collective cyber security strategy and specific, as technological, as well as legal instruments for its implementation. The use of resources in the field of electronic communications and computing capacities in cyber space, allows to the enemy the possibility of simultaneous launching operations, from various points on the globe, by the masking its own military operations in form of crime or terrorism done by unknown perpetrators, and by the distorting the status and rights of the neutral party to the conflict. The fact that cyber warfare applies the same funds, the techniques and methods used in the field of cyber crime, terrorism and intelligence activities, indicates its very specific nature, which allows states to launch attacks on opponents covertly. The cyber attacks are not covered by any of the acts of aggression, but are the acts directed against the sovereignty, territorial integrity and political independence of country, committed by other country which often hides its actions, since those are not made by the conventional armed forces whose effects are clearly visible, and therefore they represent a latent form of aggression.

**Keywords:** The crime of aggression, the Rome Statute, cyber space, cyber warfare, cyber weapons.

### INTRODUCTION

Under international law, an aggression is most prominent and the most brutal violent tool, and because of that it represents an act of force, ie an attack of one or more states against another state. From that point of view, the aggression is a criminal offense, ie a crime. As a crime against international (world) peace, the aggression implies international responsibility, according to the Charter of the United Nations. Commonly, international law defines war as “armed conflict between states in order to achieve political superiority, which uses means that are provided by international law”<sup>1</sup>

Cyber attacks are not covered by any of the acts of aggression, but are acts directed against the sovereignty, territorial integrity and political independence of states committed by other countries, which often conceal their actions, since they are not made by the conventional armed forces whose effects are clearly visible, and therefore they represent a disguised form of aggression.

Historically, the definition of the concept of aggression is accompanied by a number of difficulties and different attitudes. Some countries saw in the aggression a sign of salvation against foreign interference in its internal problems, while others considered aggression as limiting factor in achieving their own interests. In this regard, aggressive wars are a constant in development of mankind, which has very long “history of war” as its indispensable part. However, only the criminalization of aggressive war, ie, their definition as a separate criminal offense, still does not have a long history.<sup>2</sup>

1 Kreca M., *Public International Law*, Faculty of Law, Centre for Publishing and Information, Belgrade, pp. 361-365, 2010.

2 Skulic M., *The International Criminal Court - Jurisdiction and Procedure*, Publications Center, Faculty of Law, Belgrade, ISBN: 86-7630-021-6, pp. 282, 2005.

## AGGRESSION IN INTERNATIONAL CRIMINAL LAW

History of the criminal act of aggression begins with the history of war and international law in general. Only in the 20th century, after the end of World War II, the term “aggression” was first used in an official international legal act - Versailles Peace Treaty of 1919th year, which established a special tribunal for the trial of the German king Wilhelm II, which, however, never occurred, because the king fled to the Netherlands, which has refused to extradite him. The fact that it is considered especially interesting is that the intention of the authors of the Versailles Peace Treaty was not to accuse the German kaiser for aggression but for performing a “violation of international morality and the sanctity of treaties”, and it is the reason why some authors consider that this provision as a norm that has no legal character of the material, but only in a formal sense.<sup>3</sup> They have defended their attitude by arguing that the aggression has never been declared a criminal offense, and none has ever been tried on that basis, and the trial of the German kaiser for aggression constituted a retroactive application of retroactive legislation, which was unacceptable.<sup>4</sup> However, in order to prevent that future offenders of aggression go unpunished, it was agreed to approach in the near future to the definition of this criminal offenses and prescribing penalties for the same, which proved to be no easy task.

The decades-old struggle for an acceptable definition of the offense of aggression as an international crime, was accompanied by many problems and one of these problems, and the same legal complexity arises from the obvious differences of international criminal offenses in relation to other international crimes that are condemned by the international community. It was also derived from the definition of aggression adopted by UN General Assembly resolution A/RES/3314 of 14 December in 1974., which is included in the concept of state in a broader sense, meaning that it applies to all internationally recognized state, regardless of whether they are members of the UN or not.

The UN Charter, it is prohibited to the states, not only armed attack, but any use of force which is directed against the political independence or territorial integrity of any State, or which is contrary to the purposes and principles of the UN. According to the mentioned Resolution A/RES/3314, the aggression is the use of armed forces of a state against the sovereignty, territorial integrity or political independence of another state. In this regard, accented that the use of the armed forces of a state is against the Charter, and it is the evidence of performance of the act of aggression.

As an international crime, aggression can be done not only by states, but also by individuals as top officials of the state and the individual’s responsibility for aggression can not be separated from the responsibility of the state. It is for this purpose and voted and entered into force in mentioned resolution in 1974. year, however, what needs attention is its Article 5 in which only mentions the term “international responsibility”, and does not specify what kind of responsibility it is. The reasons for this, and for not specifying the type and form of international responsibility could be traced to the fact that precise determination led to a failure to compromise on the text of the resolution.

Disclosed indicates that the aggression is an international crime that threatens the peace and security that are as goods guaranteed by the UN Charter. Since everyone agrees on the importance of the mentioned goods, the conclusion that could be drawn is that peace and security are the “essential interests of the international community.” In this regard, aggression is international crime for which the state and the aggressor should be responsible.

## THE ESTABLISHMENT OF THE INTERNATIONAL CRIMINAL COURT, AND FINAL DEFINITION OF THE CRIMINAL OFFENSE OF AGGRESSION

At the Diplomatic Conference held in Rome under the auspices of the UN, 17 July 1998. the Statute of the International Criminal Court ie the Rome Statute is adopted, which established

<sup>3</sup> Stojanovic Z. & Kolaric D., *Aggression in the International Criminal Law*, Proceedings of XII International Scientific Conference: International Criminal Acts, ISBN:978-86-83437-73-3, pp. 42, 2013.

<sup>4</sup> Ferencz B. B., *The Crime of Aggression*, in: McDonald G. K. & Swaak-Goldman O. (eds.), *Substantive and Procedural Aspects of International Criminal Law: Commentary*, ISBN: 978-90-411-1135-7, Volume I, The Hague: Kluwer Law International, pp. 39, 2000.

the International Criminal Court.<sup>5</sup> According to Article 5 of the Statute, the Court had jurisdiction over the crime of aggression, but, according to the paragraph of the same Article, formally it could not be carried out until the adoption of the provisions laying down the elements of the crime of aggression and establishment the conditions under which the Court may have jurisdiction.

On 7th August 2009, the UN Secretary General convened the conference by inviting all member states of the Statute to attend the same. The invitation was sent to the states those are parties to the Statute but they were not ratified to attend as an observer, in the same capacity were also invited representatives of the countries that are not party to the Statute, representatives of international, intergovernmental and non-governmental organizations, and between 31 May - 11 June 2010, the delegates representing countries around the world met at the first Review Conference of the Rome Statute of the International Criminal Court in Kampala, capital of Uganda. The conference had more goals, but it was certainly the most important work on the adoption of amendments to the Articles of Association concerning the definition of criminal acts of aggression. In connection with the aforementioned, the last working day of the conference adopted the report of the conference working group for the crime of aggression<sup>6</sup> and the resolution adopting the amendment that amends the Statute, so that included the definition of the offense of aggression and the conditions under which the Court may perform its jurisdiction with respect to this crime.<sup>7</sup> Same resolution conference adopted amendments to the elements of the crimes related to the crime of aggression.

The adopted solution under the “crime of aggression” means the planning, preparation, initiation or execution, by a person in a position effectively to exercise control or direct the political or military action of the state, acts of aggression, which by their nature, severity and extent is an open violation according to the UN Charter. On the other hand, the “act of aggression” means the use of armed force by a state directed against the sovereignty, territorial integrity or political independence of another State, or use in any other manner that is inconsistent with the UN Charter, whereby the definition of these actions use the solution from the UN General Assembly Resolution No. 3314 from 14 December in 1974. year.

According to the adopted decision, the Court based its jurisdiction over the crime of aggression only in relation to those crimes of aggression which are made a year after the first 30 states ratifying the amendment, and so they can not come before the first January in 2017. when the declaration on them was anticipated (requires a two-thirds majority of the member states). That points to the fact that these amendments will enter into force in accordance with Article 121 Of the Statute, but the Court, however, can not perform its jurisdiction with respect to this crime before 1 January in 2017. year.

## CYBER WARFARE AS A FORM OF INFORMATION WARFARE

Starting from the UN resolution under which the aggression is defined as “the use of armed force by a state against the sovereignty, territorial integrity or political independence of another state,” the conclusion to be drawn is that cyber warfare is one kind of aggression. Although it is not covered under any of the acts of aggression, cyber warfare is an offense directed against the sovereignty, territorial integrity and political independence of states committed by other countries which usually conceals their actions, given that it is not done by the conventional armed forces whose effects are clearly visible, it represents concealed form of aggression.

In the broadest sense, cyber warfare involves attacks on enemy electronic communication systems using computer viruses or electromagnetic explosions in the atmosphere that have been made in order to disable all of the information and communication systems in one region.

The weapon used in the cyber war has a broad meaning. In cyberwar, malicious code, com-

<sup>5</sup> Rome Statute of the International Criminal Court, U.N. Documnet A/CONF.183/9, 17 July 1998. Internet Source: <http://untreaty.un.org/cod/icc/statute/rome.htm>; Date of view: 9.12.2013.

<sup>6</sup> *Report of the Working Group on the Crime of Aggression*, Review Conference of the Rome Statute, International Criminal Court, 2010. Internet Source: [http://iccepi.int/iccdocs/asp\\_docs/RC2010/RC-5-ENG.pdf](http://iccepi.int/iccdocs/asp_docs/RC2010/RC-5-ENG.pdf); Date of view: 9.12.2013.

<sup>7</sup> The crime of aggression resolution of the International Criminal Court, RC/Res.6, adopted at the 13th plenary meeting, on 11 June 2010. Internet Source: [http://icc-cpi.int/iccdocs/asp\\_docs/Resolutions/RCRes.6-ENG.pdf](http://icc-cpi.int/iccdocs/asp_docs/Resolutions/RCRes.6-ENG.pdf); Date of view: 9.12.2013.

puter instructions or data have the role of the bullet. Computer hardware is the means by which this “bullet” is created and delivered to the target of the attack. Operators that use information systems, or a programmer who writes programs that take cyber attack is a fighter. According to outlined three elements are the basis of the cyber attack: software, hardware and the attacker. Each of them is an essential for the law of war in conflict regulation. They must be used in accordance with the principles of the law of armed conflict, and the fact that they are used in combat activities makes them a legitimate aim of the attack. Generally speaking, the weapons in cyberwar represents each program, technique or device that are using information and access to information resources from opponent systems for the purpose of military action against them.

Flow of the cyber warfare in cyberspace or through the cyber space, and the activities in it or through it (as a significant part of the information fields) represent one of its basic characteristics.<sup>8</sup>

The fact that the attackers usually undercover themselves and their nature is unknown is also considered as essential characteristic of the cyber warfare. The attackers are not necessarily members of the armed forces, but they can be civilians or hired IT experts. The means with which the cyber attacks are performed usually have a basic peaceful purposes. Attacks may have distributed source and target. In this regard, the cyber warfare blurs the distinction between civilians and combatants, and in terms of the attacker and in terms of goals, and in most cases it is difficult or impossible to determine the state responsibility for launching the cyber attacks.

Compared with traditional warfare, the cyber warfare can have low cost of application in relation to the actual effects of the attack. It does not take place in a separate area as a purely military activity, but largely it has a cross-section with the cyber crime and spying, from which it differs only intention triggers an attack, rather than the means, methods and techniques. Therefore, the biggest problems in defining the cyber warfare is to determine the boundaries between the cyber warfare, crime and terrorism. Difficulties arise in the field of determination whether the use of propaganda, media influence or any other form of information operations through the cyber space is the cyber warfare.

According to aforementioned, the nature of the cyber warfare is determined by the applied tools and methods, and not by the nature of the target.<sup>9</sup> A cyber attack represents offensive use of the cyber weapons to the cyber target, but also to the traditional goal. On the other hand, the use of traditional means of kinetic attacks on of the cyber target (eg, the bombing of a computer center or physical destruction of your computer) is not a of the cyber warfare. In order to better define the demarcation mentioned concepts it is considered essential to define the position on the constitution of the cyber warfare and its acceptance at the international level, as well as the establishment of an appropriate legal framework, and subsequently its criminalization as the crime of aggression.

## CYBER WARFARE AS AN ACT OF AGGRESSION

In order to provide answers to the question whether the the cyber war is an act of aggression, a group of authors is based on the UN resolutions to which aggression is defined as “the use of armed force by a State against the sovereignty, territorial integrity or political independence of another state,” where the Council security, based on the given formulation determines whether the cyber attack an act of aggression or not. However, as mentioned formulation enumerates forms of aggression that includes “invasion or attack the armed forces, military occupation and annexation by the use of force” taken against the state, “the use of any weapon” against the state, as well as the attack on the armed forces of other state, assessment of the nature the cyber attacks can go from extremes that every the cyber attack an act of aggression, the attitude that it is not any, because their effect is kinetic, and do not represent the application of physical force. Consequently, the formulation does not provide an answer to the question whether the the cyber attack an act of aggression.

8 Mladenovic D. D., Jovanovic D. M., Drakulic M. S., *Defining of Cyber Warfare*, Military Technical Courier, ISSN: 0042-8469, Vol. 60, No. 2, pp. 90, 2012.

9 Rausher K. F., Yaschenko V., *Russia - U.S. Bilateral on Cybersecurity: Critical Terminology Foundations*, EastWest Institute & Information Security Institute Moscow State University, 2011; Internet Source: <http://ewi.info/russia-usbilateral-cybersecurity-critical-terminology-foundations>; Date of view: 9.12.2013.

Other group of authors believes that the qualification of the nature of the cyber attacks should be based on consequence, rather than type of attack<sup>10</sup>, because the use of biological and chemical weapons shows that the application of kinetic force may not be a criterion for the evaluation of nature of the attack and the consequences of action. In this regard, the cyber attack resulting in death or destruction of physical facilities should be considered an act of force. The nature the cyber warfare is very complex and it seems that many forms of the cyber attacks in general can not be detected, and that in most cases it is not possible to determine who are its perpetrators. In addition, the the cyber attackers could be governmental bodies, but not necessarily.

Beside the fact that the cyber attack does not harm national security, territorial integrity and political independence of literal passing through the communication of information to the target, one of the biggest problems of state jurisdiction in cyberspace stems precisely from the fact that digital data in separate packets of information pass seamlessly across borders. Each state has jurisdiction over its own territory, but there are exceptions, for example, when it is applied to diplomats of foreign countries. Jurisdiction over the parties along ethnic lines with their home country, even if they are not physically located on their territory. In practice, there is another, the security principle of sovereignty, which is understood as “the principle of the jurisdiction in which the nation can take the right to punish the state for certain conduct outside its territory, which is directed against its security, territorial integrity and political independence.” This principle, which is in form suitable for use in situations of the cyber warfare is not adopted by the international community, but individual states are abusing it by the “right of the stronger.”

In the professional community, there are proposals to in the area of regulating the cyber warfare introduce a third state, called “a state other than war,” which is, by its nature, between war and peace, and thus allows the simultaneous application of the law of armed conflict, criminal law and human rights<sup>11</sup>. Regardless of the multitude of conflicting views, in the international community there is an initiative to start building international regulations, which began with the efforts to define common views and adopt a common taxonomy in this area, which initiators are the USA and Russia.

The reason for this lies in the fact that an increasing number of cyber attacks, hidden under the veil of crime, is a specific form of inter-state aggression. Lacking the nature of war, on criminal acts can not be applied law of armed conflict. However, these situations are hiding a latent threat to the outbreak of inter-state conflict. As an example can serve numerous national colored conflicts in cyberspace: Israel-Palestine, the Russian-Estonian, Russian and Georgian, Serbo-Albanian, Indo-Pakistani, North Korean-American and Armenian-Azerbaijani. All of these conflicts took place in the form of criminal acts in the cyber space, but are essentially a form of inter-ethnic conflict information in the cyber space. Although their effects had low intensity and temporary in nature, these conflicts in cyberspace are not isolated and were part of a wider area of conflict between the above mentioned countries (national unions), and therefore had the potential to develop into a form of high intensity conflict. Such a danger emphasize announcements of military officials in the U.S. and Russia about considering the cyber attacks equivalent to an armed attack as armed aggression on which they will respond with military means in accordance with national doctrine.<sup>12</sup>

Asymmetry of effects of such conflicts is real, so that the the cyber attacks could send military responses with physical force, and vice versa.<sup>13</sup> Launched cyber attacks can be the cause of the escalation of the conflict, and the consequences of previous acts of aggression. Taking into account the specific nature of the cyber warfare, there is little likelihood of interstate or internal civil war that will take place exclusively in cyberspace, but that does not mean that such con-

10 *The Information Security Doctrine of the Russian Federation*, No. Pr-1895, The Security Council of the Russian Federation, 9 September 2000; Internet Source: <http://dcaf.ch/Chapter-Section/5-Information-Security-Doctrine-of-the-Russian-Federation>; Date of view: 9.12.2013.

11 Rauscher K. F., Korotkov A., *Russia-U.S. Bilateral on Critical Infrastructure Protection: Working Towards Rules for Governing Cyber Conflict*, East-West Institute, pp.36-37, January 2011; Internet Source: <http://www.ewi.info/working-towards-rules-governing-cyber-conflict>; Date of view: 9.12.2013.

12 Gorman S., Barnes J. E., *Cyber Combat: Act of War*, The Wall Street Journal, 31 May 2011; Internet Source: <http://online.wsj.com/article/SB10001424052702304563104576355623135782718.html>; Date of view: 9.12.2013.

13 *International Strategy for Cyberspace*, The White House, May 2011; Internet Source: [http://whitehouse.gov/sites/default/files/rss\\_viewer/internationalstrategy\\_cyberspace.pdf](http://whitehouse.gov/sites/default/files/rss_viewer/internationalstrategy_cyberspace.pdf); Date of view: 9.12.2013.



flicts would not happen in the future. Almost all modern conflicts in some form include activities in the cyber space. A cyber warfare ideally fit to the concept network centric and asymmetric warfare, and especially on state of relations that are between war and peace. This circumstance causes the acceptance of the existence of the other states of political relations, such as the state of “different from the war,” which accepts both existence of the state of war and state of peace during a conflict. It can also be expected to occur new forms of conflict that are different from the traditional conflict where conflict may happen between one or more countries on one side and one or more countries on the other. In addition to these linear conflict, new forms of complex, distributed form of conflict can be expected, in which is possible the war of “all against one” or “one against all” where participants are not necessarily state entities, but it can be anyone, from individuals to network groups individuals. Proposals for the establishment of new forms of state of relations between the countries represent attempt to facilitate the implementation of the existing legal framework of the armed conflict in cyberspace, common law, international criminal law and the other forms of law, both in terms of their content, and in terms of simultaneity applied to concrete cyber incident or attack.

### CONCLUSION

Defining the notion of aggression is accompanied by a number of difficulties and different attitudes. The reason for this lies in the fact that the said issue is of great importance, and it is not just international criminal character, but it is extremely important in the wider political relations at the international level. In international law, the concept of aggression is linked primarily to the definition contained in the UN resolution A/RES/3314, according to which aggression represents use of military force by a State against the sovereignty, territorial integrity or political independence of another State, or in any other manner that is inconsistent with the UN Charter. However, it did not become the basis for determining the specific criminality of aggressive war in the Rome Statute, although aggression fell within its jurisdiction.

A specific form of interstate aggression is also a growing number of cyber attacks. In this regard, cyber warfare represents offensive and defensive application of cyber weapons and information. The same is initiated and organized by state actors, on the one hand to destroy or dismantle the opposing goal, as by direct action on information and information systems as well as indirect effects on systems, equipment, services, processes, society and individuals who depend on that information and information systems, on the other hand in order to defend their own capacities of such activities of the opponents.

Starting from the UN resolution A/RES/3314, the cyber warfare is a form of aggression. Although it is not covered under any of the acts of aggression, cyber warfare represents offense directed against the sovereignty, territorial integrity and political independence of states committed by other countries which usually conceals their actions, given that is not done by the conventional armed forces whose effects are clearly visible, represents latent form of aggression. Outlined points to the necessity, first, accepting the cyber warfare on an international level, as well as establishing appropriate legislation, and then its criminalization as a crime of aggression.

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22. Internet Source: <http://dcaf.ch/Chapter-Section/5-Information-Security-Doctrine-of-the-Russian-Federation>;
23. Date of view: 9.12.2013.



## RESPONSIBILITY OF LEGAL ENTITIES FOR ECONOMIC AND FINANCIAL CRIMES IN THE REPUBLIC OF MACEDONIA

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**Abstract:** Liability of legal entities for economic and financial crimes was introduced into the Criminal Code of the Republic of Macedonia in 2004, but a redefinition was made with the amendments to the Criminal Code in 2009. Parallel responsibility is predicted for the legal entities in the cases where the offense is committed by a responsible person or another employee of the legal entity when the offense is committed in the name and on behalf of the legal entity, and financial sanction measure and confiscation of property is also predicted. The analysis of liability of legal entities through criminal acts which are criminalized in the Criminal Code of the Republic of Macedonia is the goal of analysis, and the current practice and the submission of criminal charges of a criminal investigation of a situation by the method of “case studies” are also analyzed.

**Keywords:** keywords legal entity, liability of legal entity, parallel responsibility.

### INTRODUCTION

Economic and financial crime is a dynamic and constant socially negative phenomenon which directly affects the socio - economic development of the state, political situation and overall social life of the citizens. This type of crime is noticed with the appearance of the first abuses by Roman officials who abused some of the taxes, and there were provided penalties for the returning the concealed amount double, and then also loss of political rights. Throughout the history the existing forms and shapes are changing, but always the motive of completing these offences is identical - the acquisition of wealth in a criminal manner. Perpetrators of economic and financial offences act individually, but in recent years the criminal actions are more and more organized, and thus the damage of this crime is higher and the victim is often the state. Transitional states are “suitable land” for appearance of new forms and shapes of economic and financial criminality where perpetrators skillfully use their expertise and professional knowledge, their positions, the power in society especially the political power in passing legislation and making decisions.

In literature there is no single definition of economic and financial crime. We use the terms corporate criminality, criminality of white collars, corruption, crime of curve zones etc. Committee of Ministers of the Council of Europe in the Recommendation no. ( 81 ) 12 defines economic and financial crime through individual criminal behavior: cartel offenses fraud and abuse of the economic situation from the multinational companies, fraud and abuse to obtain national and international donations, computer crime, fake companies, forging balance accounting or legal persons offenses, fraud given the economic situation and corporate capital companies, breaking the security standards and protect the health of employees, fraud to the detriment of creditors (bankruptcy, breach of banking or industrial rights) fraud consumers, unfair competition, fiscal offenses, customs offenses, offenses targeted control offenses and money market exchange. <sup>1</sup>

Economic and financial criminality has several important characteristics: low perceptibility, complexity, difficulties in detecting and processing, mild penal policy, legal imprecision and problems with the delinquents. Its meaning can be spoken according to the scope and severity of the consequences

<sup>1</sup> Kambovski V., Krivicna odgovornost na pravnite lica – Komparativna studija I predlozi za novi zakonski resenija, Makedonska revija za kazneno pravo I kriminologija, br. 2 – 3, Skopje, 2008, no.325 – 326.

or the damage, primarily as a financial and social consequences, and the fact that this type of crime causes definite processes that can lead to destabilization of the social relations also. The threats for the development of democracy are serious, rule of the law and human rights and national security, stability and economic development of the states of South - East Europe and beyond.<sup>2</sup>

In recent years the economic and financial criminality became our serious reality associated with senior officials in the structure of the authority. Criminal cases have been discovered in the region of denationalization, bankruptcy, public procurement, tax evasion, abuses of labour rights and many other areas where the officials of detecting confronted with numerous difficulties in the process of detecting clarifying and providing evidence for successful criminal procedure and sanctioning of the preparators. Apart from the subjective or personal responsibility of the preparators of the economic and financial crimes abusing official position, authority, expert and professional knowledge, it was pointed out the need to introduced also criminal liability for legal entity. Criminal situations in practice suggest acquiring unlawful gains not only for the preparators - directors. Officers, depot but for legal entity in whose name and in whose account the preparators have committed crimes.

Provided criminal liability of legal entity is a good legal basis for confiscation of criminal proceeds as the direct preparators of crimes and legal entity who acquired illegal property proceeds benefit. The most accomplished financial crime in the Republic of Macedonia from 1997 to 2009 – “Tax Evasion” immediately after the crime “Abuse of official position and authority” to 2004 year was predicted responsibility for physical and responsible persons in legal entities, but it was not provided accountability for those who ordered the crime, and not suffer the consequences of criminal behaviour. For committed crime with elements responsible were those who followed the orders - perpetrators, while the employees did not have any responsibility, and criminal proceeds and unpaid taxes are on behalf on their firms. This is the strongest reason for the introduction of criminal responsibility of legal entity or it means that the founders are also responsible. But in the process of the research, it is very important to clarify the subjective responsibility of the direct perpetrators, and the type and the height of unlawful property benefit of the caused damage. Criminal liability of legal entity is provided only for certain economic and financial crimes where legislator considers that the direct perpetrator of a criminal act in the name and on behalf of particular legal entity, is not provided criminal liability of legal entity is a good legal basis for confiscation of criminal proceeds as the direct perpetrators of a criminal act in the name and on behalf of particular legal entity, is not provided in most official criminal crimes.

Obligation to the national legislation for introducing criminal liability of legal entities is regulated with the Council of Europe Convention on money laundry, freezing and confiscation of yields of crime (the Strasbourg Convention) of 1990, as well as the latest Convention on money laundry, freezing and confiscation of yields of crime and the terrorism of 2005 year, Criminal - Legal Council of Europe Convention for the Prevention of Corruption in 1999 year and UN Convention UN Corruption of 2004 year, such an explicit commitment includes the UN Convention against Transnational Organized Crime (Palermo Convention) of 2000 year, under which responsibility of the legal entity does not depend on the responsibility of individuals who committed offences, and the obligation for the status of liability of legal entity also includes the Council of Europe Convention for penalty –legal environmental protection of 1998 year. These solutions are also adopted in the EU law: the Convention for the Protection of the financial interests of the European Union since 1955, the Convention on the elimination of corruption which involved officials of the European Communities or officials of Member States of the European Union of 1997 and the Framework decision on prevention of organized crime of the Council of Ministers of the European Union since 2005 year stipulates the obligation of the member States to make a status on the criminal liability of legal entity for offences committed for their benefit by a person who is acting individually or as part of the body of the legal entity or who has a leading position within the legal entity, the Convention on Cybercrime of 2001 year provides staturation on liability of legal entity for such offences.<sup>3</sup>

2 Arnaudovski Lj, Nanev L., Nikoloska S., Ekonomskiot kriminalitet vo RM, Makedonska revija za krivicno pravo I kriminologija, br. 1, Skopje, 2009, no. 176.

3 Kambovski V., Krivicna odgovornost na pravnite lica – Komparativna studija I predlozi za novi zakonski resenija, Makedonska revija za kazneno pravo I kriminologija, br. 2 – 3, Skopje, 2008, str. 325 – 326.

The overall conclusion of the Conference on the Prevention of Economic Crime Council of Europe held in 2005 in Kashkashu, Portugal, attended by 250 experts from 50 countries from the public and private sector indicates that the economic and financial crime, which is usually organized is a threat for democracy, rule of law and human rights, as well as free competition and social and economic development. According to the consensus opinion, the market economy can be effective only if the "rules of the game" are fully respected.<sup>4</sup>

Republic of Macedonia has accepted most of the recommendations of the international documents and in 2004 introduced the criminal liability of legal entity for certain offences, while with the amendments in 2009 and completion, economic crime redefinition is made and it has been introduced criminal liability for legal entities for all offences where offenders can commit crimes on behalf on legal entities, and it has been provided the liability for legal entities in bankruptcy and those where the status is changed. The practice shows more criminal cases where investigators and prosecutors stipulate criminal liability for legal entities, so the legal entities are registered as offenders, certainly as direct perpetrators are registered individuals who have status of responsible persons in legal entity or perform duties and tasks in or for the legal entity.

## CRIMINAL LIABILITY OF LEGAL ENTITIES

Legal entities perform significant economic and financial and other functions and are important actors in the economic and legal relations as real entities have their own rights and responsibilities. From decade ago in the European legislation the idea for their criminal responsibility has become a reality with the change of the traditional negative view of introducing this kind of responsibility and adopt international conventions which predict the obligation of the state to make a status of criminal liability of legal entities.

The need of punishing of legal entities is justified by their greater participation and importance as legal entities in the legal – economic life.<sup>5</sup>

The introduction of liability of legal entity for committing offenses in the area of criminal law, in fact, is a form of public reaction toward the rise of economic crime, as well as the various types of organized crime whose actors are just legal entities. Namely, the results of numerous criminological research show that crime of legal entity is a social reality that can not and must not ignore the modern criminal law. Social danger of these acts is particularly large, given the fact that behind these works stand legal entities that have significant economic, and often political power. For effective prevention of these acts is not enough to punish the individual who is in the service of the legal entity. Criminal responsibility of the individual must not be a cover for the irresponsibility of the legal entity, for its illegal actions, because exactly a legal entity has benefited from the committed offense. It would be unfair legal entity to go unpunished for committing offenses by individuals on behalf of benefit and on behalf of legal entities. Measures which can be taken toward legal entity within civil or administrative liability is not sufficient to remove and prevent economic and financial crime.<sup>6</sup>

Liability of legal entity is old-new institute in our legislation because in the former legislation was envisaged liability of legal entity for offenses and economic offenses. Up to the changes and additions of amendments to the criminal legislation of Republic of Macedonia in 2004, the legal entities in the legal system responded for offenses and committed civil offenses, until 1997 and for committed economic offenses, but not for crimes.<sup>7</sup>

The criminal liability of legal entity is established with the changes and additions of amendments to the Criminal Code (2004), it is presumed criminal liability of the legal entity for the actions which carried out or failed to carry out its members, acting in the legal life in the

4 Kambovski V., Krivicna odgovornost na pravnite lica – Komparativna studija I predlozi za novi zakonski resenija, Makedonska revija za kazneno pravo I kriminologija, br. 2 – 3, Skopje, 2008, str. 325 – 326.

5 Vitlarov T., Pravnite lica kako subject na kaznenoto pravo, Makedonska revija za kazneno pravo I kriminologija, br. 2, 2006, str.86.

6 Markovic I., Odgovornost na pravnite lica vo kaznenoto zakonodavstvo vo Bosna I Hercegovina, Makedonska revija za kazneno pravo I kriminologija, br. 1, Skopje, 2009, str. 51 – 77.

7 Stojanov I., Vostanovena krivicna odgovornost na pravnite lica, Godisnik na Policiskata akademija, Skopje, 2005/06, str. 164.



capacity of responsible persons its representatives, or members of the governing bodies.

Macedonian legislator provides criminal liability of legal entity in the cases provided by law for the crime committed by a responsible person in a legal entity, on behalf of or benefit of a legal entity. Legal entity is responsible for a crime committed by his employee or representative of the legal entity with which is realized property gain or to else are inflicted significant damage if: execution on conclusion, order or other decision, or approval of the management body, body of management or supervisory body is the commission of an offense or up the commission of the offense was a result of leak obligatory supervision of the management body, the body managing or supervisory body or management body, the body of the managing or supervisory body does not prevent a crime or concealment or not reported before initiating criminal proceedings against the offender. Criminally responsible are all legal entities with the exception of the State.

Legislator instituted parallel responsibility of the responsible person in the legal entity and legal entity, and the criminal liability of the legal entity does not exclude the liability of the perpetrator of incrimination, which is totally at spot, because otherwise it would have led to a situation to prosecuted legal entity and not the physical person who actually committed the crime. According to the letter of the law, criminally responsible are all domestic legal entities and foreign legal entities if the act is committed in the territory of the Republic of Macedonia. It is quite logical and correct that from criminal liability is excluded the State, whose existence can not be questioned in any way, not even with a crime which eventually can be performed from any of its representatives or agents.<sup>8</sup>

The amendments to the Criminal Code of the Republic of Macedonia (2009) and substantial changes have been made in Article 28 - a, so it is provided for criminal liability of legal entity in cases determined with law, the legal entity is responsible for a crime committed by a responsible person in the legal entity, on behalf of or benefit of a legal entity.

Liability in the event of bankruptcy and change the status of a legal entity is newly introduced liability of legal entities which are in bankruptcy proceedings in order to prevent liquidation without consequences to obligations to creditors. Legal entity that is in bankruptcy is responsible for the crime committed up to bringing decision to open bankruptcy proceedings, if with the act is acquired significant property gain for him or to else inflicted significant damage. If before the completion of the criminal proceedings against a legal entity come to an acquisition, merger, division or other status change in accordance with the law, because of which it has lost the status of a legal entity, criminal proceedings will continue against his legal cooperator or successors.

The legal entity should be accountable and when the conditions are fulfilled and other elements of the crimes committed by the person in charge or any other legally prescribed offender if for determined reason is excluded individual wines (incompatibility, misconception, death of the offender), and crime is committed, on behalf of and for the benefit of the legal entity. It is the basis for a parallel and autonomous responsibility of the legal entity. Conception of autonomous responsibility of the legal entity is the basis for the reprimand is not in the individual subjective psychological elements (awareness, willingness), but in the collective will and conscience of the legal entity (all members of its organs, and all workers in the legal entity are aware that joined in a separate legal entity, not to perform, approve etc. crimes, but to carry out economic and other activities). It is affairs assumed responsibility for the organization of the legal entity, such as fault in the broadest sense of the deviations from the social demands for a proper and legal work of legal entity.<sup>9</sup>

The legal entity is responsible for all crimes committed on its behalf or in its favor. According to Academician Kambovski in modern criminal law when it comes to the institute, the liability of legal entity, the theory of reality, according to which the capacity of the legal entity, determined by the activity for which it is registered, may not be crucial for his delinquent ability. It is registered as a legal entity, regardless of which activity exists in the real world economic and social life and may be liable for acts that are not related to its activity.<sup>10</sup>

It is important to specify the actions of individuals that trigger the liability of the legal entity. According to the Macedonian Criminal Code these are actions carried out by the responsible

8 Stojanov I., Vostanovena krivicna odgovornost na pranite lica, Godisnik na Policiskata akademija, Skopje, 2005/06, str. 167 (1).

9 Kambovski V., Krivicna odgovornost na pravnite lica – Komparativna studija I predlozi za novi zakonski resenija, Makedonska revija za kazneno pravo I kriminologija, br. 2 – 3, Skopje, 2008, str. 325 – 326.

10 Kambovski, V., Organiziran kriminal, Skopje, 2005 godina, str. 185.

person in the legal entity, or the governing body. It is necessary for clarification of economic crimes first to determine the subjective responsibility of the responsible person, his motives, and when the benefit is directed toward the legal entity with its properties responded it. Because it is necessarily the interpretation of the notion of authorization: formal authority, defined by law and by other acts and the actual functions and powers of the body or an individual acting on behalf of the legal entity. No responsibility to the right person when the person responsible have committed criminal acts in his own name and for their own interest, in such cases we have some of the offenses with elements of abuse of office.

Liability of a legal entity has become practice in filing criminal charges when there are elements of the crimes that incurred when as a perpetrator or accomplice, is a legal entity. Thus, according to the statistical records of public prosecution in the Republic of Macedonia since the introduction in 2004 until 01.06.2006, a total of 154 legal entities were reported. According to the structure of reported crimes, most are reported for crime customs fraud; non-compliance with the court order; violation of labor rights; violation of social security; violation of copyright and related rights; issuing bad check credit card abuse.<sup>11</sup>

From these acts it can be concluded that against legal entities commonly filed criminal charges for criminal acts committed by the group of economic crime (violation of labor rights; violation of social security; not perform judicial decision and issuing bad check and abuse credit card). Practice by filing criminal charges against the legal entities are enriched with new charges and against other economic and financial crimes, but because the computer system of the Ministry of Interior is not yet prepared a special program for data entry of the criminal charges against legal entities, such as with individuals.

The legal entities have their own identity, or features such as the name of the legal entity, the owner, founder, founders, Manager - person responsible, management authority, signatory of the bank account, tax number, etc. When filing criminal charges for criminal acts committed by a legal entity, it is necessary to provide the original data from the Central Register of the Republic of Macedonia.

In the criminal procedural legislation<sup>12</sup>, the legislator regulates the matter to establish the criminal liability, the pronouncing of fines and other measures that may be imposed against legal persons.

In pre-trial proceedings are handled in detecting parallel illumination and proving of economic crimes committed by individuals with traits of responsibility and so on. And when, as perpetrators, accomplices that appear are legal entity. Towards the legal and responsible person in the legal entity, as a rule, is conducted a single investigation, which in subsequent stages passes in a single criminal proceeding provided that the responsible entity and legal entity appear as perpetrators of a crimes of one criminal law event.

In proceedings before the Public Prosecutor, if it is submitted criminal charges against the responsible person or against representative of the legal entity, and there are grounds for suspicion that there is criminal liability of a legal entity, the Public Prosecutor may require ex officio initiation of criminal proceedings for the same criminal offense against the legal entity.<sup>13</sup> With this provision, the law regulates the possibility of expanding the prosecution, the establishment of a parallel responsibility of the responsible person or representative of a legal entity and legal entity itself.<sup>14</sup>

11 Vitlarov T., Pravnite lica kako subject na kaznenoto pravo, Makedonska revija za kazneno pravo I kriminologija, br. 2, 2006, str.89.

12 Law on Criminal Procedure, Official Gazette of the RM no. 15/05, Art.511 – 524.

13 Law on Criminal Procedure, Official Gazette of the RM no. 15/05, Art.512.

14 Stojanov I., Vostanovena krivicna odgovornost na pranite lica, Godisnik na Policiskata akademija, Skopje, 2005/06, no. 170

**CRIMINAL LIABILITY OF LEGAL ENTITIES FOR ECONOMIC  
AND FINANCIAL CRIMES**

**SUMMARY OF OFFENSES COMMITTED BY LEGAL ENTITIES  
AND CRIMINAL CHARGES FOR 2011**

LEGAL ENTITIES		responsible entites in legal entities		LEGAL ENTITIES		responsible entites in legal entities	
Art. 166	0	Art. 166	1	Art. 166	2	Art. 166	4
Art. 167	3	Art. 167	3	Art. 167	3	Art. 167	5
Art.213	1	Art.213	1	Art.213	/	Art.213	/
Art.225	5	Art.225	5	Art.225	1	Art.225	2
Art.230	1	Art.230	1	Art.230	/	Art.230	/
Art. 247	2	Art. 247	5	Art. 247	2	Art. 247	8
Art. 248	1	Art. 248	1	Art. 248	/	Art. 248	1
Art. 249	2	Art. 249	3	Art. 249	1	Art. 249	1
Art. 254	0	Art. 254	2	Art. 254	/	Art. 254	/
Art. 257	2	Art. 257	7	Art. 257	5	Art. 257	6
Art.273	2	Art.273	4	Art.273	2	Art.273	2
Art. 279	21	Art. 279	25	Art. 279	26	Art. 279	24
Art. 280	7	Art. 280	14	Art. 280	20	Art. 280	18
Art. 285	10	Art. 285	12	Art. 285	2	Art. 285	6
Art.286	1	Art.286	1	Art.286	17	Art.286	14
Art.358	1	Art.358	2	Art.358	/	Art.358	/
Art. 377	0	Art. 377	0	Art. 377	1	Art. 377	1
Art 378 at.4	25	Art 378 at.4	24	Art 378 at.4	14	Art 378 at.4	14
Art.379	0	Art.379	2	Art.379	0	Art.379	1
Art. 380	1	Art. 380	1	Art. 380	4	Art. 380	3

*Table no. 1<sup>15</sup>*

<sup>15</sup> Data are provided by the Ministry of Interior - Bureau of Public Security

Economic and financial crimes by groups in the Criminal Code are as follows:

**1. Crimes against the rights and freedom of man and citizen**

- Prevention of access to the public information system - Article 149 – a;

**2. Crimes against elections and voting**

- Abuse of funds to finance the election campaign - Article 165 a;

**3. Crimes against labor relations**

- Violation of rights of labor relation – Article 166 -for which in 2011 was filed one criminal charge against the responsible entity in the legal entity. While in 2012 were submitted 4 criminal charges against responsible entity, and also were submitted charges against two legal entities.

- violation of rights of social security – Article 167 – for which in 2011 were filed 3 criminal charge against the legal entity, and also 3 criminal charge against responsible entity in the legal entity. In 2012 the number of criminal charges against legal entity stayed the same, while the number of criminal charges against responsible entity in legal entity increased to 5.

-not taking measures for protection at work – Article 170 and

- violation of the right to participate in management – Article 171

**4. Crimes against sexual freedom and sexual morality**

- Mediation in prostitution - Art. 191 Par. 5 (perpetrator legal entity)

- Displaying pornographic material to a child - chl.193 pg. 6 (perpetrator legal entity)

- Production and distribution of child pornography - Art. 193 - a (perpetrator legal entity)

- Crimes against marriage, family and youth

- dispensers alcoholic beverages to minors - Art. 204 pg. 4 (perpetrator legal entity)

**5. crimes against public health**

- transmission of infectious disease Article 205;

- failure according to health regulations during an epidemic Article 206;

- Negligent performance of pharmaceutical activity of article 211;

- production and release of harmful medical for trade- 212

- Production and release of harmful food and other products for trade-213 - in 2011 was submitted 1 criminal charge against legal entity, and also were submitted charge against one legal entities.

- negligent execution of the examination of meat food - 214

- Enabling the use of narcotic drugs - Article 216 par. 3 (perpetrator legal entity)

**6. crimes against the environment**

-environmental pollution Article 218

-pollution of water for drinking Article 219

-production of harmful medications for treatment livestock and poultry Article 220

-transmission of infectious diseases in animal and plant life Article 222

-pollution of living environment and nature with waste materials Article 223

-usurpation of property Article 225; for which in 2011 were filed five criminal charges against the responsible entity in the legal entity and five criminal charges against the legal entity. While in 2012 were submitted 2 criminal charges against responsible entity, and also were submitted charges against one legal entities.

-Illegal exploitation of mineral resources - Article 225 – a

-forest devastation Article 226

-illegal fishing Article 229

-endangering the environment with waste materials Article 230

**7. crimes against property**

- Fraud - Article 247 (perpetrator legal entity), ; for which in 2011 were filed five criminal charges against the responsible entity in the legal entity and 2 criminal charges against the legal entity. While in 2012 were submitted 8 criminal charges against responsible entity, and also were submitted charges against 2 legal entities.

- fraud the buyers Article 248 - for which in 2011 were filed one criminal charge against the responsible entity in the legal entity and one criminal charges against the legal entity. While in 2012 was submitted one criminal charges only against responsible entity.

- Fraud in obtaining credit or other convenience Article 249 - for which in 2011 were filed 3 criminal charges against the responsible entity in the legal entity and 2 criminal charges against

the legal entity. While in 2012 was submitted 1 criminal charges against responsible entity, and also was submitted charge against 1 legal entity.

- Fraud at the expense of the funds of the European Community Article 249 - 1,
- Fraud insurance Article 250
- Damage and unauthorized entry into a computer system Article 251
- Making and introduction of computer viruses Article 251 - and
- Computer Fraud Article 251-b
- Fraudulent bankruptcy Article 254 - in 2011 was filed 2 criminal charges against the responsible entity in the legal entity.
- Causing bankruptcy with reckless operation of section 255
- Abuse of bankruptcy proceedings Article 256
- Damage or privileging of Creditors Article 257 - in 2011 were filed 7 criminal charges against the responsible entity in the legal entity and 2 criminal charges against the legal entity. While in 2012 were submitted 6 criminal charges against responsible entity, and also were submitted charges against 5 legal entity.

#### **8. crimes against public finance, payment and commerce**

- Money laundering and other criminal proceeds - Article 273 - in 2011 were filed 4 criminal charges against the responsible entity in the legal entity and 2 criminal charges against the legal entity. While in 2012 were submitted 2 criminal charges against responsible entity, and also were submitted charges against 2 legal entity.

- Issuing a bad check and credit card abuse Article 274;
- Preparation and use of fake credit card 274 - b
- fraud with working at securities and shares Article 275;
- Unlawful treatment of auditor - Article 275 - b
- Report of the proceedings of public announcement, the award of a public contract or a public-private partnership - Article 275 - c,
- Unlawful manufacture Article 276;
- Smuggling - Article 278
- Customs Fraud - Article 278 - a
- Concealment of goods which are the subject of smuggling and customs fraud - Article 278 - b

- Tax evasion Article 279 - in 2011 were filed 25 criminal charges against the responsible entity in the legal entity and 21 criminal charges against the legal entity. While in 2012 were submitted 24 criminal charges against responsible entity, and also were submitted charges against 26 legal entity.

- Forging or destroying business books in Article 280 - in 2011 were filed 14 criminal charges against the responsible entity in the legal entity and 7 criminal charges against the legal entity.

While in 2012 were submitted 18 criminal charges against responsible entity, and also were submitted charges against 20 legal entity.

- Creation of monopoly position and distortion on the market - Article 283
- Unfair competition in matters of foreign trade operations - Article 284
- Infringement of industrial property rights and unauthorized use of another firm - article 285 - in 2011 were filed 10 criminal charges against the responsible entity in the legal entity and 12 criminal charges against the legal entity. While in 2012 were submitted 6 criminal charges against responsible entity, and also were submitted charges against 2 legal entity.

- Violation of the right of the registered or protected invention and topography of integrated circuits - article 286 - in 2011 was filed 1 criminal charge against the responsible entity in the legal entity and 1 criminal charge against the legal entity. While in 2012 were submitted 14 criminal charges against responsible entity, and also were submitted charges against 17 legal entity.

#### **9. criminal offenses against official duty**

- Giving bribes - Article 358 - in 2011 were filed 2 criminal charges against the responsible entity in the legal entity and 1 criminal charge against the legal entity.
- against legal mediation Article 359.

**10. Crimes against justice**

- Cheating banned from fines and legal consequences of conviction Article 376  
 - Non-compliance the court decision Article 377 - in 2011 has no filed criminal charges for legal entities, while the 2012 was submitted 1 criminal charge against responsible entity, and also was submitted charges against 1 legal entity.

**11. Crimes against legal traffic**

- Document Forgery Article 378 par. 4 (perpetrator legal entity) - in 2011 were filed 24 criminal charges against the responsible entity in the legal entity and 25 criminal charges against the legal entity. While in 2012 were submitted 14 criminal charges against responsible entity, and also were submitted charges against 14 legal entity.

- Special cases of forging documents - Article 379 - in 2011 were filed 2 criminal charges against the responsible entity in the legal entity in 2012 was submitted 1 criminal charges against responsible entity.

- Computer forgery Article 379 - a

- Use a document with false content article 380 - in 2011 was filed 1 criminal charge against the responsible entity in the legal entity and 1 criminal charge against the legal entity. While in 2012 were submitted 3 criminal charges against responsible entity, and also were submitted charges against 4 legal entity.

**,CASE STUDIES,- OPERATIVE ACTION “ARIEL”**

From Macedonian police in October 2011 was conducted operational action, Ariel, following a plan and the coordination of the Ministry of Interior and the Public Revenue. In this operational action were applied complex operational tactical combinations by applying more operational-tactical measures, investigative actions and special investigative measures whereby it was revealed an organized criminal group of Macedonian, Bulgarian and Serbian nationals which criminally acted in the period 2005 - 2011, same occurs tax of at least 2 million, and managed to laundry 20 million criminal money. It's a group of 21 members in which organizers were Macedonians who would find poor Bulgarians whom for amounts of 50 to 150 euros established firms in the country as foreign investors and signed orders, in this way the organizers committed the crime.

In this network of financial crime, were created a number of companies that allegedly have dealt with various activities, and under the guise of foreign investors committed five crimes: “criminal association”, “tax evasion”, “Money laundering and other criminal proceeds” “Counterfeiting and destroying business books” and “abuse of official position and authority.” With the crime of tax evasion was caused damage to the Budget of Republic Macedonia in the amount of 115,813,340.00 or 1,882,354 euros. Subject of crime “money laundering and other proceeds”, are funds in the amount of 1,341,821,642.00 denars or 21,818,220 euros.

The owners were constantly unavailable for Public Revenue Office to make inspection for return of value added tax, because the companies didn't exist on the addresses that have been registered.

The members of the criminal group by issuing false invoices enable companies customers fake invoices to legalize undocumented goods purchased and at the same time allow them to perform offsetting input VAT calculated in bogus invoices with their output VAT and unfounded to gain cash, with which has committed the crime of tax evasion.

Also, the establishment of companies have a role in receiving, transmitting and covering funds that are the subject of a crime, in order to disguise the ownership and facilitate their legalization, committed the crime of money laundry and other proceeds. Trade in goods or how to made certain services expressed with VAT of 18% and guided to five companies-users of false invoices, which these companies represent input VAT, which then unfounded offset with their output VAT. These companies allegedly made services or goods purchased on the black market, with the receipt of false invoices was legalized after they were sold to other companies and received inflows of funds accounts. Because the undertakings - beneficiary of false invoices had the need to purchase other goods (also undocumented, on black), tidal means of sold goods were transmitting to accounts of 13 companies issuers of false invoices, then, others reported



(issuers of false invoices), raised (for a fixed contractual remuneration) as cash which betrayed on the hand of responsible persons in the companies declared beneficiaries of false invoices, which allowed them to unfounded to gain cash.

After clarification of the criminal case and provided evidence materials the Centre of combating organized and serious crime, Unit of Financial Crime in the Ministry of interior Affairs of the Republic of Macedonia in coordination and cooperation with the Public Revenue Skopje to the Public Prosecutor filed five criminal charges against 16 individuals (14 Macedonians and two Bulgarian nationals) and 5 legal entities (companies), where five of the individuals have committed the criminal offense of "tax evasion" in Art. 279 of the Criminal Code, and they are in the capacity of responsible persons in legal entities that have been reported after Art. 297 Par.3 v.v. 28-a, while the remaining 11 individuals are reported for crime "complicity" in Article 22 v.v. with chl.279 of the Criminal Code of the Republic Macedonia. In the investigation it was found that through the criminal acts committed in the period from 2005 to 2011, the abuse on the basis of tax concealed it damaged the budget for a total of 27,482,538 denars, or 446,870 euros.

In the specified practical case the police suspected and legal entities for the committed crime "tax evasion" and "money laundering and other criminal proceeds" and the first offense is a predicate for the existence of money laundering as a secondary crime caused of the first crime in order the offenders to laundry criminal money acquired. Also, it is evident that the registration of legal entities is with criminal intent or have used legal entities in order to realize utilization of fictitious invoices and return of value added tax. In Macedonia, the practice is rich with similar criminal situations of which the bigger is Tax Pyramid of the 2005, but because of lack of criminal responsibility of legal entities were covered only physical and responsible persons in legal entities.

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## CHARACTERISTICS OF THE SERBIAN POLICE CIVIL SERVICE SYSTEM – TOWARD IMPLEMENTING MODERN CIVIL SERVICE STANDARDS<sup>1</sup>

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**Abstract:** Professional and efficient national administration systems require setting up the civil servants status in a new manner in order to adopt and implement common European principles. Professionalization of police is an issue of high priority, regarding the importance of functions it performs like the human rights prevention and maintaining the peace in society. Police officers have to be high qualified, trained, motivated, political neutral in order to execute tasks efficiently. Due to specific nature of police functions and its character, status of police officers is regulated in a specific manner which entirely or partly differs from the contemporary rules and practice in other administrative bodies (civil service). The aim of the paper is to outline and analyze main elements of the Serbian police civil service system in comparison with practice in other fields of the civil service, in the light of the harmonization with modern civil service standards. It is to point out to the need to examine, innovate and change police regulation in accordance to the need of society and officially adopted and recognized standards. Thus, some elements of civil servants status such as: open and competitive selection and recruitment of candidates based on merit and transparent criteria, evaluation of performance based on determined performance criteria, promotion based on merit, legal protection may be introduced and effectively implemented in the police. It will provide professional and efficient work and enable development of an integral and coherent civil service system.

**Keywords:** Police Civil Service System, Rule of law, Professionalism, Contemporary Civil Service standards.

### INTRODUCTION

The anticipation of European Union membership has its impact on civil service systems in all candidate countries. Preparation for the membership gradually worked as a factor and incentive to shape and develop structures and institutions capable of meeting the obligations and needs of an EU member state. Serbia, as a candidate country is obliged to develop sufficient capacity to implement European policies and to take on the obligations of membership. Failures of a member state would be detrimental firstly for their own citizens rights and secondly for the common interest of all member states represented by the institutions of the European Union. The European civil service baselines are to promote principles of professionalism, openness, merit based recruitment, fair and equal treatment, as opposed to informality, incompetence, favouritism and political patronage.

The Ministry of Internal Affairs is a key line ministry, delivering essential functions, such as the human rights prevention and maintaining the peace in society. Due to character of police functions and excessively complex organization and management, legal status of police officers is regulated in an exclusive manner, intensifying the divergence within national civil service system. Evidently, retaining exclusions from the general legislation is necessary and justified, but it is also indispensable to adopt and efficiently implement modern civil service principles - merit principle, professionalization and de-politicization, non-discrimination principle, transparency, openness, responsibility, efficiency. In addition to that, substantial issue is to find *equilibrium* of accepting contemporary (and widely recognized) civil service standards and maintaining exclusions only where necessary. This dilemma is fundamentally associated with the harmonization of civil service standards in entire administration. The ambition is to

<sup>1</sup> This paper is the result of the realisation of the Scientific Research Project entitled “*Development of Institutional Capacities, Standards and Procedures for Fighting Organized Crime and Terrorism in Climate of International Integrations*”. The Project is financed by the Ministry of Education and Science 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.

accomplish an integrated operation of the civil service system and to undertake a systematic review of the legislation and adopt by-laws to regulate specific field of administrative work in a new way. In spite of a strong tendency to maintain old, inherited legislation and practice, new regulations should be adopted, as a basis for professional, efficient, effective and high quality work. Aside from external assistance, domestic commitment is required.

### **INTRODUCING EUROPEAN CIVIL SERVICE STANDARDS – DIVERGENCY OF THE POLICE REGULATIONS AND PRACTICE**

Institutions of the European Union have done a lot of efforts in order to define standards and principles for public administration development. SIGMA has developed a set of civil service baselines aiming to provide effective, quality and professional public administration performance. The most important european civil service standards refer to the professionalism and merit based civil service system - equal access to working posts, obligatory public competition, open and competitive selection based on transparent criteria, legal protection of candidates, promotion based on performance appraisal, fair salary system, career opportunities, effective disciplinary and penal remedies, establishment of a cross-government systems for personnel management, development of management practices ensuring that public servants are motivated to perform well (SIGMA Baselines, 1999). A highlighted and priority target for Serbia is a creation of a civil service system based on merit, which would be comparable to the systems in EU member states (SIGMA, *Action plan*, 2013). A comprehensive legislative reform is required, providing a basis for the further administrative reform and effective implementation of government policy. Consequently, it will enable developing of a modern, responsible, professional civil service.

European civil service standards have been incorporated in Serbian general civil service legislation in 2005. Due to specific nature of police functions and its character, the police civil service system has been regulated divergently from the general civil service. According to the Article 4 of the *Law on Civil Servants*, the rights, obligations and responsibilities of civil servants which are not otherwise regulated by this *Law* or special laws or secondary legislation, general labor legislation and special collective agreement shall be applied. In respect to this, legal status of police officers is regulated primarily by the *Law on police* and alternatively by the *Law on civil servants* and *Law on labour*. That presumes partly or entirely exclusion of the general civil service legislation in this field of administrative work. Nevertheless, taking into account the complexity of police organisation, nature of tasks, methods of work, management, some general rules might be applicable to the police civil service system. Furthermore, the fundamental request of the european institutions is to implement standards of professionalism, depoliticization, non-discrimination, equal access to working posts, political neutrality, impartiality, legal accountability, openness, transparency, accountability. Anti-corruption policy, undertaking anti-corruption measures and improved cooperation of all public authorities to fight corruption is also one of the highest priorities of the European Union (SIGMA, *Assessment*, 2013). As noted in the *Strategy paper for the Republic of Serbia 2014-2020*, “the administrative capacity of relevant public authorities and especially inter-institutional cooperation and coordination among relevant public authorities such as police, customs and tax authorities, remains insufficient for proper joint investigations.”

Programs of the European Union are strongly focused on harmonizing with EU *acqui* on Chapter 24 and on specific support for the police to carry out complex tasks. According to the *National priorities for the international assistance (2014-2017)*, the priority areas for the future development are professional police, organization and management, safety of citizens and of the state, cooperation at national, regional and international level, developing citizens trust, external and internal control and transparent work. Integrity systems have been incorporated into the civil service and officials should be aware of their obligations and of the ethical behaviour expected of them. Improvement of working methods and principles of police operation with focus to the strategic planning and human resource management are the highlighted priorities which should be improved.<sup>2</sup> Trained and motivated police officers should be capable of applying

<sup>2</sup> See in: Evropska komisija, *Izveštaj o napretku Srbije za 2013 godinu*, Brisel, 2013.

sound administrative procedures in line with EU principles and there offering legal certainty to citizens (SIGMA 2013-2020, 2013). In this regard, we will elaborate main elements of the general civil service systems - job classification system, recruitment and promotion system, career development possibilities, the system of disciplinary responsibility and generate points of a comparison with the police civil service system.

The job classification system is the crucial element of a civil service, as it constitutes the basis for the classification of ranks, promotion, performance appraisal, career development, remuneration. It should ensure that the job descriptions are based on the complexity of duties, the necessary degree of independence in the performance of duties, the required skills, the scope of supervision over the operations, the required educational background and relevant professional experience. The job classification system in general Serbian civil service is regulated by The *Decree on Civil Service Job Classification and Job Description Criteria*. The *Decree*, however, does not apply to positions in the police, their legal status and career development, which fundamentally varies from other civil servants legal status. Not applying these rules ignores the need for the job descriptions in the *Job Systematisation Act* to be based on the complexity of duties, the necessary degree of independence in the performance of duties and the required competences.

Consequently, police officers and other persons employed in the Ministry of Interior have the appropriate job titles, which are determined under the *Law on Police*, and further specified under the *Government Decree*. In accordance with the *Law on Police*, the ranks are classified in three main categories: authorized officials and police officers in charge of fire protection activities; other police officers; and other persons employed in the law enforcement agencies. The rule prescribes that for each position/job minimum two and maximum six appropriate titles (ranks) must be determined. In other words, on all the positions, it is possible to acquire all the titles envisaged for the respective professional qualification degree required to work in certain jobs - the condition is the minimum professional experience required. This (career) system allows for vertical promotion within one position by advancing to higher ranks. A previously acquired rank can be changed - by a promotion to a higher rank, i.e. demotion to a lower rank. The requirements for the advancement to the next higher rank in the police include *inter alia* relevant professional experience, qualifications, and performance appraisal. Therefore, there could be a need to re-examine to what extent the ranks in the above system actually express the expertise of the employees and their ability to perform the duties of a certain degree of complexity, or whether it links the rank of the employee and his/her duties in the job, as the ultimate effect of this system could be that the salary does not reflect the complexity and responsibilities, which would be a disincentive to employees. It is interesting to note that for a person recruited with previously recognized years of service, the position is determined in accordance with the overall length of effective service. That means that the "overall length of service" as a criterion for assignment to a higher position (including a higher qualification requirement) would include also the years spent on performing lower qualification requirement duties. It has to be taken into account that the job classification system (for officers) ensures the preconditions for the recruitment and vertical promotion in accordance with one's professional ability (merit-based principle), transfer (mobility), objective and fair appraisal, systematic monitoring, professional development and the employee remuneration system. Remuneration in police, due to specific nature of tasks and competences is an important element of career system aiming to attract and retain qualified staff. These legal provisions should be revised in order to establish a relation between the salary and functions which are performing at certain working post and working results achieved. Increase of the salaries of police officers is also the issue of significant impact to efficient performance and an efficient tool against the corruption. According to European standards, the establishment of civil service salary system shall ensure principles of predictability, transparency and fairness by means of setting adequate salary levels and providing incentives for performance. To develop the integrated operation of the civil service system, it is necessary to review the legislation and adopt by-laws to regulate this issue in a new way.

The rules for classification of executorial positions provided by the *Civil Servants Law* do not apply to employees in the police, unlike the provisions of the *Law* governing the status of appointees (Director of Police, State Secretary, Secretary to the Ministry). In order to

ensure the professional independence of civil servants from political influence, there is a need to consider specifying a wider range of appointees. That would mean that the appointment, selection, accountability, and dismissal rules would have a wider application. They would apply also to the managers of other organizational units (Heads of Regional Police Administrations, Heads of Administrations within Police Directorate Headquarters, and others) who perform professional duties and who have considerable powers and responsibilities in their work. That would ensure the preconditions for de-politicisation, the managerial positions would have to be filled through an internal or open competition, based on professional skills, which would strengthen professionalism and provide stability and continuity. Naturally, these processes can be developed only in the conditions of “departization” and separation of personalized political influence - from the state apparatus.

### **RECRUITMENT AND PROMOTION – TRANSPARENCY VS. CONFIDENTIALITY**

It is widely assumed that merit based recruitment improves the performance of public administration and the prospects of successful implementation of EU policies (SIGMA, 2012). Both the European Commission and SIGMA pay particular attention to systems of open competition for access, standardised examination mechanisms and de-politicised and fair selection. Mandatory advertisement of job vacancies, in particular for recruitment from outside the civil service, the existence of written and oral examination procedures, professional selection committees that take decisions free from political influence and possibilities for appeal against the outcomes of recruitment processes, serve as the most important indicators of the civil service recruitment. European Commission noted that “recruitment in Serbian civil service is a problem concerning non-transparent recruitment procedures”.<sup>3</sup>

The procedure for recruitment through internal or public competitions, stipulated by the Serbian *Civil Servants Law* (and its amendments), does not apply to employees in the police. In principle, they are recruited through a competition (the same applies to the appointment and executorial positions). However, a competition “is not required for the recruitment of police officers” (Article 112, Para 2, of the *Law on Police*). The Government Decree may establish positions that are filled without announcing a competition. Consequently, it may indicate a possible violation of the principles of transparency, non - discrimination and equal access to jobs in the Ministry. It also increases the risk that employment without competition will become the general rule rather than exception in the Ministry. This rule is not in harmony neither with constitutional provisions granting equal access to the civil service, and it contravenes the merit principle nor with mainstream European principles and standards of recruitment in secure bodies.

In addition to this, the *Law on Police* does not regulate the procedure for recruitment without competition (at the request of citizens), and the citizens are placed in an disadvantaged position, considering that the general acts, which are published in the Official Gazette, do not provide information about the recruitment conditions and procedure. Besides, the *Law* and sub-legal acts do not stipulate written tests, examination systems and other verifications of competences in the context of recruitment procedure. Such non-transparent recruitment practices in the state authorities are in contrast with the generally accepted international standards and the EU standards. In accordance with the international law, citizens are guaranteed freedom and the right to employment in the state authorities, including not only the right to apply for a competition for employment, but also to be treated equally as the other applicants in the selection process. They have the right to be “duly” informed about the course of the competition procedure, and to be aware of the reasons for their being “unsuitable” for employment. The secrecy may constitute a risk for the establishment of the democratic rule of law. The low level of merit institutionalisation implies that the Ministry has a large degree of discretion over selection decisions. Development and enhancement of Human Resource Unit in the Ministry, would be of great importance and high priority. The Unit would have responsibility for the selection and

<sup>3</sup> See in: Evropska komisija, *Izveštaj o napretku Srbije za 2013 godinu*, Brisel, 2013.



recruitment, coordination of evaluation of performance and verification of the promotion based on merit. It will be independent in its work. The conduction of the analysis of human resource policy and procedures in the Ministry, is also recommended. The aim of the analysis would be development of efficiency, simplification of procedures and provision of transparent procedures of employment and promotion based on merit.

Regarding the European standards, the establishing performance evaluation systems shall promote principles of effectiveness while ensuring fair and equal treatment of civil servants. Bearing in mind main objectives of the appraisal, we believe that certain rules governing the appraisal of civil servants could be applied to the assessment of police officers, especially when it comes to the assumptions, assessment criteria, and the assessment procedure. Considering that the *Decree on Civil Service Job Classification and Job Description Criteria* does not apply to positions in the police, the criteria for their appraisal cannot be determined in accordance with it. In accordance with the regulations governing vertical promotion of police officers, the link between their promotion and appraisal is established only formally - "an officer can be promoted if he/she has obtained the highest marks for his/her performance over the last two years, and has spent in the rank at least half the time required for obtaining the next higher rank." In addition, an employee who has achieved significant results and made a significant contribution to the performance of the police duties may extraordinary advance to the next higher rank. The criteria for assessment of police officers are similar to those that apply to other civil servants, and the same can be said for the marking categories. In accordance with the provisions of the *Law on Police* and the *Government Decree*, police officers are assessed annually to determine the conditions for promotion, advancement to a higher rank or demotion to a lower rank, and are given a positive or a negative mark for their performance. At the present moment, the performance review in police cannot ensure fair and objective treatment of police officers. As a result, it is without any substantive consequence for the promotion, remuneration or training. In that respect, there is a need to review the legal provisions and by-laws and regulate the complex issue of appraisals in a new way.

Vertical promotion to a higher rank should be based on the oversight of the employees' performance by their immediate line managers, performance assessment, and the obtained marks. It must ensure the conditions for the officers' career development - their vertical promotion (advancement to a higher rank or demotion to a lower rank), professional development, remuneration, and termination of employment. This would include a comprehensive legislative review process and the development of new practices, as well as planning and implementation of training programs for those who would perform appraisals and the employees who would be subject to appraisals. Recognizing the professional potentials of employees and providing the conditions for advancement to higher ranks influences the motivation of the employees and encourages them to improve their performance. Police officers' training has to be in compliance with personnel policy, promotion plan, evaluation system and remuneration. Training in police has a crucial role for development and definition of culture in the future and for the provision of efficient and high quality performance. The fragmentation of training policy remains a major problem, in particular poor coordination of the training activities of line ministries and of training provided in the context of international assistance programmes. In addition, consideration should be given to the role and responsibilities of the Human Resource Unit within the Ministry, and the cooperation and coordination should be developed with the central human resource management body - Human Resource Management Service, which aims at ensuring the integrated appraisal procedure in the public administration bodies.

From the aspect of the legal security of employees and the protection of their labour rights, the rules on the appraisal procedure are of special importance. The assessment of police officers is performed by the heads of organisational units, and the performance of the heads of organisational units is assessed by the General Police Director or the officer in charge of carrying out certain duties and tasks or a police officer whom they may authorise. An employee may file a complaint to the senior officer who gave him/her the mark, who in turn forwards the complaint and his/her opinion on the merits of the complaint to the senior officer authorised by the Minister to decide on complaints, and his/her decision is final. The employee's complaint will be decided by the same senior officer who had already assessed his/her performance, and



that raises a question of the objectivity and fairness of the assessment. In the second instance, the resolution is made by the authorised person (authorised senior officer). As the rights and obligations of employees in the first instance are decided by the head of the respective body (or other responsible persons), transferring the decision-making authority to a (higher) second-instance body would ensure greater objectivity in handling complaints, bearing in mind the distance that the higher-level body has in relation to the matter that is being decided. It is clear that one can consider authorising the Government Complaints Commission to decide in these matters, given its competence, experience, and the necessary capacities. The establishment of the Commission's competence would improve significantly the realisation and protection of the police officers' rights. On the other hand, the civil servants in the other levels of the government (central and local) are not always fully aware of the competencies of the bodies that decide on their rights and obligations either. Although Serbia has significantly improved the realisation and protection of the civil servants' rights by having established the relevant second-instance body, this issue needs to be regulated in a coherent manner to ensure that the civil servants have equal and effective legal protection. It also takes time to develop practice and competences as well as the conscious of public servants.

Regarding civil service development baselines, all national administrative systems should impose the rules on impartiality and integrity of public servants, prescribing effective disciplinary sanctions for the breaches of legal duties and ethical behavior. These rules are to increase individual responsibility of civil servants and to provide professional, fair, efficient, impartial and politically neutral performance. Disciplinary accountability of the Ministry of Interior is governed by the *Law on Police* and the *Decree on Disciplinary Accountability*. Any failure to comply with the provisions of the *Code of Police Ethics* also provides grounds for establishing accountability for conduct that may be characterised as (severe) breach of duty. *The Law on Police* also provides a list of breaches of duty pertaining to employment (severe and minor). In accordance with the amendments to the *Law on Police*, the competence to instigate disciplinary proceedings is separated from the competence to conduct disciplinary proceedings and decide on disciplinary accountability, thus ensuring the independence of the person conducting the procedure.<sup>4</sup> In accordance with the previous legal provisions, the practice was for the head of the authority to authorise a police officer to conduct disciplinary proceedings, while "retaining" the competence to adopt the decision. However, that created dissatisfaction by both the disciplinary officer who conducted the proceedings, and the employee against whom the proceedings are conducted, as the decision on his/her accountability and the disciplinary action were brought by a person not directly involved in the proceedings. The main objective of the disciplinary proceedings is professional and impartial treatment, and rendering a lawful decision on the basis of the identified facts, applying the appropriate substantive and procedural rights. The second-instance authority is the Disciplinary Commission, a collegial body that works through its panels, which consist of a presiding judge and two members, one of whom is not employed in the Ministry. The decision of the Disciplinary Committee may be contested by initiating an administrative dispute. In accordance with the above legal provisions, the Ministry officials do not have the right to file a complaint (objection) to the Government Complaints Commission - it is not competent to decide on their accountability in the second instance. As the rights and obligations of employees in the first instance are decided by the head of the respective body (or other responsible persons), transferring the decision-making authority to a (higher) second-instance body would ensure greater objectivity in handling complaints, bearing in mind the distance that the higher-level body has in relation to the matter that is being decided. Considering that the Complaints Commission is independent in its operations, and that its members are experts in the field of public administration, consideration could be given to establishing its competence to handle these matters. That would significantly improve the administrative practice and "equalise" the legal employment status of the public administration employees.

<sup>4</sup> See: *Law on Amendments to the Law on Police* ("Official Gazette of RS", No. 92/11).

### CONCLUDING REMARKS

Bearing in mind that the European Union accession is a strategic goal of Serbia, one of the fundamental requirements is to develop administrative structures capable of implementing the European policies. The institutions of the European Union have developed civil service baselines in order to ensure professional, efficient and impartial performance of public authorities. Professionalization of civil service systems is to identify the legal framework whereby the status of civil servants is set out in a new manner and which regulates basic principles regarding the work of those employed in the public administration. This principle should refer to all administrative bodies in a national administrative system. In respect to that, police civil service system should adjust its organization, management and legal status of employees in accordance with European standards and general civil service standards. That will encourage harmonization of the administrative practice and equalize civil servants' status. A coherent and integrated operation of the civil service should be accomplished.

Despite the attempts to meet European requests, the professional police civil service system has not been sufficiently developed. Considering specific character of police functions, complexity of organization and management, we may acknowledge that police regulations should retain necessary exclusions from the general rules. Conversely, there are no justified reasons for reluctance to adopt widely recognized and accepted general civil service standards. The essential elements of the professionalization and de-politicization - open competition, competitive and objective selection of candidates based on merit and on transparent criteria, job classification system based on functions, promotion based on merit, stimulating pay system, individual responsibility of civil servants, prevention of corruption, impartial performance, establishment of personnel management systems should be effectively implemented in the Ministry. Indicatively, the merit system in police is still hampered by the long lasting cultural and traditional habits. Not applying the rules on the job classification system, equal access to working posts, obligatory public competition selection, legal protection of candidates, promotion based on performance appraisal, fair salary system, ignores the need for recognizing fundamental contemporary civil service principles. The inherited practice is not in harmony neither with constitutional provisions, nor with mainstream European principles and standards of recruitment in secure bodies. The main objective is to re-examine and review the legislation and change the laws and adopt by-laws in a new way corresponding to general civil service standards. All the efforts will influence the public administration reform as a whole and accelerate approaching European Union. An overall review of the legal regulations should be launched with a view to harmonizing them with general civil service principles. It remains to be seen whether reforms will change practices and attitudes.

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## MANAGING EU MARITIME BORDERS: THE ROLE OF FRONTEX

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**Abstract:** Since the establishment of the European Agency for the Management of the Operational Cooperation at the External Borders of the Member States of the European Union (FRONTEX) in 2004, the border controls of the Member States, and, especially, the sea borders controls have received increased attention. These controls are exercised not only in the territorial waters, but also at the High Seas, especially in the Mediterranean, because of the major influx of illegal immigrants from the North African/South Mediterranean countries. Joint patrolling can also be exercised in the territorial waters of participating third states. These operations include interception and returning of vessels and their re-direction to its country of origin. The operational capacity of FRONTEX was strengthened recently with the new operational rules which give the right to the Agency to buy or lease its own equipment for missions on its own or with cooperation with the Member States and to request national seconded staff for its operations. FRONTEX and Member States conducted numerous joint operations at sea, and now have increased responsibility in this respect after the advent of the Arab Spring and the situation in Syria, as well as the recent tragedy near the Italian island of Lampedusa since when the flow of illegal immigrants and human trafficking became hot political topic in the EU. These developments triggered the options for joint drone operations as well as launching a fully - fledged EU military mission in the Mediterranean in order to stop human trafficking. The aim of this article is to assess the effectiveness of FRONTEX operations and its contribution to the implementation of the overall immigration and asylum policy of the European Union.

**Keywords:** Frontex, maritime borders, immigration, asylum, joint operations

### INTRODUCTION

Since FRONTEX became operational in 2005, it was apparent that sea borders will take significant part of the Agency's portfolio. This was due to the specificity of the sea borders – they are much more difficult to control, require significantly more human, technical and financial resources, there is no clear borderline with posts and barriers – on the contrary they are much more diffuse and require much more attention and invention by the Agency. EU faced the problem of illegal migration more intensively at the beginning of the 1990s, when numerous small boats packed with refugees and migrants reached the coasts of Europe. This triggered the debate about the common EU migration and asylum policy leading to the “Fortress Europe”. But, on the other hand, this triggered much wider socio-technical intervention by the EU in the countries of origin (and transit) of the migrants, in line with its policy to eliminate/mitigate the causes for such migration. According to FRONTEX, the number of those migrants refused the entry at EU sea border is around one third of all EU-entry refusals.

The importance of FRONTEX operations rapidly increased with the upheavals of 2011 in North Africa and the Arab world – the Arab Spring. The migrant flow from these regions had risen sharply from approximately 104 000 refugees in 2009 and 2010 to nearly 141 000 in 2011 (an increase of tremendous 35%). This surge was triggered by political changes in Tunisia and sustained by the departure of many sub-Saharan African migrants from Libya. Besides the migration from these countries, it is interestingly to note that the second and third most common countries of origin were Afghanistan and Pakistan, and Afghans and Pakistanis constituted 25% and 3.7% respectively of all detections of illegal border crossings in 2010.<sup>1</sup>

Sea border controls are divided into: 1) border checks conducted in ports and 2) border surveillance conducted at sea. FRONTEX role in border surveillance includes a research

<sup>1</sup> <http://frontex.europa.eu/feature-stories/annual-risk-analysis-2012-NOEp8H>.

component in order to help the Member States to detect and overcome the existing vulnerabilities at their borders. In this regard, the European Surveillance System (EUROSUR) was established. EUROSUR became operational recently (December 2, 2013) and will make significant contribution to combating crime, human trafficking, drugs and weapons smuggling, as well as to detect and assist the small migrant boats in distress. The work of EUROSUR is based on the national coordination centers which collect information and coordinate the activities of all national agencies involved in border management and surveillance. These national coordination centers are obliged to share this information among themselves, as well as with FRONTEX, which generates the overall “European situational picture.” Here, new information regarding changing routes of criminal networks is contained as well as new data collected during FRONTEX joint operations and on the pre-frontier area. EUROSUR assists the Member States in detecting small vessels with the help of EU Maritime Safety Agency and EU Satellite Center.<sup>2</sup>

The importance of the Joint sea operations can be seen by the fact that the major part of the FRONTEX annual budget is allocated exactly to these operations. For instance, in 2011 59% of the budget spent on joint operations were intended for the sea borders, and in terms of total budget of FRONTEX this represented 28%.<sup>3</sup> Similarly, in 2012 nearly 59% of the joint operations budget were dedicated to sea operations, which totals 29 % of the annual FRONTEX budget.<sup>4</sup>

The focus of this article will predominantly be on the recent operations of FRONTEX (after 2011) in the Mediterranean as most critical EU sea border for preventing illegal migration.

## LEGAL FRAMEWORK

FRONTEX was established by the Council Regulation 2007/2004 of October 26, 2004, subsequently amended in 2007 and 2011.<sup>5</sup> The Agency became operational as of 3 October 2005, and it is based in Warsaw. FRONTEX is a Union body and has legal personality.<sup>6</sup> It is managed by an Executive Director, Management Board and Executive Bureau. The core powers of the Executive Director include: preparing and implementing the decisions, programmes and activities adopted by the Agency’s Management Board within the limits specified by the FRONTEX Regulation, its implementing rules and any applicable law; taking all necessary steps, including the adoption of internal administrative instructions and the publication of notices, ensuring the functioning of the Agency in accordance with the provisions of the FRONTEX Regulation; preparing an annual draft working programme and an activity report and submit them to the Management Board etc.

In 2008 following the major restructuring of the Agency, the sub-executive level was divided into three divisions: one for operations, one for training and one for administration. The Operations Division coordinates the operations and carries out the Risk Analysis Functions, The Capacity Building Division unites the training, research and development units.<sup>7</sup> In addition, within the Operations Division a separate Situation Centre was created in order to monitor and generate a short – term overall picture regarding the situation at the external borders of EU. In critical situations, 24/7 emergency response mechanism can be initiated with cooperation with internal and external partners. The Situation Centre should guarantee the availability, confidentiality and integrity of the exchange of information.<sup>8</sup>

The FRONTEX Regulation applies to all Member States, except UK, Denmark and Ireland. But the Regulation itself envisages the possibility for cooperation with UK and Ireland, and also it applies to certain non – EU states which are part of the Schengen Area – Iceland, Norway, Lichtenstein and Switzerland.

<sup>2</sup> [http://europa.eu/rapid/press-release\\_IP-13-1182\\_en.htm](http://europa.eu/rapid/press-release_IP-13-1182_en.htm).

<sup>3</sup> Frontex (2011c), ‘Frontex budget 2011’, 31 December 2011, available at: [www.frontex.europa.eu/assets/About\\_Frontex/Governance\\_documents/Budget/Budget\\_2011.pdf](http://www.frontex.europa.eu/assets/About_Frontex/Governance_documents/Budget/Budget_2011.pdf).

<sup>4</sup> [http://frontex.europa.eu/assets/About\\_Frontex/Governance\\_documents/Budget/Budget\\_2012.pdf](http://frontex.europa.eu/assets/About_Frontex/Governance_documents/Budget/Budget_2012.pdf).

<sup>5</sup> REGULATION (EU) No 1168/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 October 2011 amending Council Regulation (EC) No 2007/2004 establishing a European Agency for the Management of Operational Cooperation at the External Borders of the Member States of the European Union, *OJEU*, 22.11.2011.

<sup>6</sup> Art.15.

<sup>7</sup> Beuving, M., “FRONTEX: Its Role and Organization”, in: Monar, J. (ed), *The Institutional Dimension of the European Union’s Area of Freedom, Security and Justice*, Brussels, Peter Lang, 2010, p.229.

<sup>8</sup> FRONTEX, General Report 2008, Warsaw, 2009, p.18.



The tasks of the Agency *inter alia* are: to coordinate operational cooperation between Member States in the field of management of external borders; to assist Member States on training of national border guards, including the establishment of common training standards; carry out risk analyses, including the assessment of the capacity of Member States to face threats and pressure at the external borders; to participate in the development of research relevant for the control and surveillance of external borders; to assist Member States in circumstances requiring increased technical and operational assistance at the external borders, taking into account that some situations may involve humanitarian emergencies and rescue at sea; assist Member States in circumstances requiring increased technical and operational assistance at external borders, especially those Member States facing specific and disproportionate pressures; to set up European Border Guard Teams that are to be deployed during joint operations, pilot projects and rapid interventions; to provide Member States with the necessary support, including, upon request, coordination or organisation of joint return operations (return of the illegal migrants to their country of origin or country of transit - usually via air<sup>9</sup>); to deploy border guards from the European Border Guard Teams to Member States in joint operations, pilot projects or in rapid interventions in accordance with Regulation (EC) No 863/2007; to provide the necessary assistance to the development and operation of a European border surveillance system and, as appropriate, the development of a common information sharing environment, including interoperability of systems etc.<sup>10</sup>

The primary focus of FRONTEX is planning and carrying out joint operations and pilot projects, including the requests of Member States related to circumstances requiring increased technical and operational assistance, especially in cases of specific and disproportionate pressures. These operations can be carried out by FRONTEX with cooperation with the Member States and agreement of the host State. Joint operations detect the routes used by illegal immigrants and organized crime groups to enter the territory of the EU, as well as their interception and performing the so called joint return operations for the persons subject to return orders. For purposes of patrolling the maritime borders, EU has concluded series of bilateral agreements with third states in order FRONTEX and Member States vessels to enter their territorial waters.<sup>11</sup>

Every such operation is *a priori* subject to thorough risk analysis, carried out by the Risk Analysis Unit. The risk analysis produces general or tailored reports, which are submitted to the Council and the Commission.

For the purpose of risk analysis, the Agency may assess, after prior consultation with the Member State(s) concerned, their capacity to face upcoming challenges, including present and future threats and pressures at the external borders of the European Union, especially for those Member States *facing specific and disproportionate pressures*. To this end, the Agency may assess the equipment and the resources of the Member States regarding border control. The assessment shall be based on information given by the Member State(s) concerned, and on the reports and results of joint operations, pilot projects, rapid interventions and other activities of the Agency. These assessments are without prejudice to the Schengen Evaluation Mechanism.<sup>12</sup>

In order to carry this analysis, the Agency generates all the necessary information from the Member States, which are on the other side obliged duly to cooperate and transmit data regarding any possible threats to the external borders.

FRONTEX can deploy one or more European Border Guard Teams in a Member State faced with a situation of urgent and exceptional pressure, especially the arrival at points of the external borders of large numbers of third-country nationals trying to enter the territory of that Member State illegally (Rapid Border Intervention).<sup>13</sup> In such extraordinary situation, the Member States are obliged to transmit to the Agency the names, number and profiles of the national border guards that will join the teams within five days.<sup>14</sup>

FRONTEX sea operations are directed not only to prevent illegal migration, but also to prevent organized crime networks smuggling drugs and weapons into the EU. In this regard, in

9 Leonard, S., "EU Border Security and migration into the European Union: FRONTEX and Securitisation through practices", *European Security* 19 (2), 2010, p.245.

10 Ibid. Art.2.

11 Peers, S. et al, *EU Immigration and Asylum Law*, Martinus Nijhoff, 2012, p.126.

12 Art.4(2).

13 Art.8a.

14 Art.8b.



2007 a European Patrols Network was established in order to eliminate duplication of efforts and resources by the Member States, since after the survey of the marine surveillance system of the 8 South – European states FRONTEX came to conclusion that 50 different organs under 30 different ministries were tasked with monitoring the sea borders. EPN coordinates the efforts of the Member States and their agencies to tackle the activities of the organized crime groups, including illegal fishing, pollution and drug trafficking.<sup>15</sup> After 2009, nearly all maritime joint operations are organized under the auspices of the EPN program, with only exception being the joint operation Poseidon Sea that is part of the Poseidon Regional Program, covering also the land border with Turkey.<sup>16</sup>

In 2012 most important structural changes were the establishment of the Consultative Forum and the appointment of the European Human Rights Officer envisaged by the amendments of the FRONTEX Regulation 2011.<sup>17</sup> FRONTEX embodies a special unit – Risk Control Unit which deals especially the problem of illegal migration. Actually, the first major FRONTEX joint operations took part at sea borders and were much wider in scope and duration *vis a vis* the comparable land joint operations.

According to the Risk Management Unit Risk Analysis 2012, besides the Central-Mediterranean route which remains most problematic for illegal migration, the second critical juncture in 2011 remained the Eastern European route (especially the border between Greece and Turkey), as well as the Western Mediterranean route used mostly by migrants from Algeria and Morocco where an increase of nearly 8500 detections *vis a vis* 2010 was notified.<sup>18</sup>

From 2010 onwards the migrants tend to diversify the means used to cross the Mediterranean from simple wooden boats, toy inflatable boats (usually used to cross the Gibraltar Strait), fishing vessels, speed boats, fiberglass boats, sailing boats (usually *en route* from Greece to Italy, and swimming (particularly from Ceuta, Morocco).<sup>19</sup>

## FRONTEX OPERATIONS IN THE MEDITERRANEAN

FRONTEX assessments always stressed the EU Mediterranean border as critical in terms of major inflows of illegal immigrants. FRONTEX operations in the Mediterranean date back in 2007 starting with the cooperation with Libya on illegal migration management. Later, operation Nautilus was launched. The operation NAUTILUS II<sup>20</sup> (June - October 2007) was part of a larger operation which started in 2006 and ended in 2008. Germany, Greece, Italy, Malta, and Spain jointly contributed with equipment and personnel for conducting the operation. Italy played in this context a special role, since it maintained co operational activities with Libya from the late 1990s. However, Libya did not participate officially in the NAUTILUS II operation in 2007 and did also not allow entrance of FRONTEX patrols in its territorial waters.

On request of Spain in 2006 HERA I (July-October) operation was launched in order to identify the irregular migrants coming to the Canary Islands. Hera II (August - December 2006) expanded the operations to stopping the vessels carrying illegal immigrants from African coasts to Canary islands. For this purpose joint sea patrols were carried in the territorial waters of Mauritania, Senegal and Cape Verde. Hera III combined the features of the previous two. Similarly, HERA 2007 and 2008 included aerial and naval surveillance at the illegal migration routes from Africa to the Canary islands. Operation Minerva (July 2007) was directed at extensive canvassing of Spain's southern coast, border controls at the seaports of Almeria and Algeciras, identity checks at Ceuta, and patrolling the Spanish territorial waters flooded with illegal migrants from Algeria and Morocco. Operation HERMÉS (2007) consisted of joint patrols in the Mediterranean in order to cut down the routes to immigrants from Northern Africa to Italy and Spain. INDALO (2007) was patrolling the reopened route to Spanish coast of Levante from Morocco and Algeria.<sup>21</sup> Operation

<sup>15</sup> <http://frontex.europa.eu/operations/types-of-operations/sea>.

<sup>16</sup> European Fundamental Rights Agency, *Fundamental Rights at European's South Sea Borders*, p. 114, available at: [http://fra.europa.eu/sites/default/files/fundamental-rights-europes-southern-sea-borders-jul-13\\_en.pdf](http://fra.europa.eu/sites/default/files/fundamental-rights-europes-southern-sea-borders-jul-13_en.pdf).

<sup>17</sup> FRONTEX, General Report 2012.

<sup>18</sup> *Ibid.*

<sup>19</sup> FRONTEX Risk Analysis Unit, *Risk Analysis 2012*, pp.23-25.

<sup>20</sup> Nautilus in 2010 was renamed operation "Chronos."

<sup>21</sup> Ryan, B. Mitsilegas, V. (ed), *Extraterritorial Immigration Control: Legal Challenges*, The Hague, Brill, 2010, pp.329-330.

Agios (July – September 2006) was directed at controlling of forged documents of North African countries, of persons arriving with ferryboats from North Africa to the seaports of Tarifa, Alicante, Almeria and Algeciras. Most recent and most important operations are Hermes, Aeneas, Indalo and Poseidon Sea. In 2012 they resulted in apprehension of 18 064 migrants, 46 tonnes of drugs worth EUR 72.6 M and seizure of 2.4 million packets of cigarettes worth EUR 5.6 M.

### JOINT OPERATION HERMES

Major arrivals of immigrants to the Italian Pelagic islands were noticed from 2008 onwards.<sup>22</sup> But only after the influx of approximately 6000 migrants had arrived from Tunisia to the Italian island of Lampedusa during the first weeks of January 2011, on a request by Italy joint operation code named “Hermes” was launched in the Central Mediterranean. The joint operation started on 20 February 2011 and continued in 2012 and 2013.<sup>23</sup> Later in March, it was decided that the operation will be geographically widened to include Sardinia, and that will last until August 2011.<sup>24</sup>

At the beginning of the operation Hermes, 8 Member States were active participants (including Italy) and 6 other have committed resources. Joint Operation (JO) Hermes within only 3 weeks from launching has recorded the arrival of 3,139 irregular migrants in the Pelagic islands (Central Mediterranean). 1,015 migrants were recorded at the reception centre on the island of Lampedusa and local police authorities planned to transfer the same day 250 people to centres in mainland Italy. However, these operations for prevention of illegal immigration by intercepting and returning the immigrants was and still is with odds with some fundamental principles of the international law (principle of non-refoulement) and fundamental human rights (the right to emigrate).<sup>25</sup>

Besides the Italian experts, other screening and debriefing experts from six Member States/Schengen-Associated Countries (SACs) were processing the cases of irregular migrants. Under the provisions of Joint Operation (JO) Hermes 2011, Frontex has deployed 20 expert personnel to immigrant detention centres in Crotona in Calabria, Caltanissetta and Trapani in Sicily, and Bari in Puglia. The greatest number of irregular migrants that have arrived to date have been Tunisian, and approximately 20% of them have indicated an intention to apply for international protection.<sup>26</sup>

The JO Hermes 2012 was originally scheduled to finish on 31 October 2012, but after requests from the hosting Member States and based on risk analyses, decisions were taken to extend the JO first until 15 December 2012 and further on until 31 January 2013.

The JO Hermes 2012 Extension was established to support the Italian authorities in tackling maritime illegal migration on the coasts of Sicily, Pantelleria and the Pelagic Islands (Lampedusa, Linosa, Lampione).<sup>27</sup>

Launched on 6 May, the JO Hermes 2013 took over the JO Hermes 2012. The operation had the same ambit as its predecessor, but compared to 2012, the operational area has been enlarged to the southeast coast of Sicily. Most migrants departed from Libya, from the coastal area near Tripoli.

Most migrants detected for illegal border crossing on the Central Mediterranean route were from Eritrea (1 824) or Somalia (1 141), together representing 56% of all detections on this route in Q2 2013. West Africans (1 088) represented another large group of migrants, coming mostly from the Gambia and Mali. During interviews of migrants conducted in the framework of the JO Hermes, most Eritreans and Somalis indicated that they had left their country due to security concerns rather than economic reasons. Apparently they were threatened by regional authorities

22 See: Monzini, ‘Recent Arrivals of Migrants and Asylum Seekers by Sea to Italy: Problems and Reactions’, 13 April 2011, *Area: Demography, Population & International Migration*, 75, p.5.

23 Council of EU, “Strengthening the European External Borders agency FRONTEX - Political Agreement between Council and Parliament,” Brussels, 11916/11, Presse 192, 23 June 2011.

24 FRONTEX (2011c) Hermes Operation Extended, available at: [http://www.frontex.europa.eu/download/Z2Z4L2Zy b250ZXgv ZW4vZGVmYXVsdF9tdWx0.aWxpc3RhX3BsaWtdy8xMzU/7\\_december\\_2010.doc](http://www.frontex.europa.eu/download/Z2Z4L2Zy b250ZXgv ZW4vZGVmYXVsdF9tdWx0.aWxpc3RhX3BsaWtdy8xMzU/7_december_2010.doc).

25 Perkowski, N., “A Normative Assessment of the aims and practices of the European border management agency FRONTEX, April 2012, *Working Paper Series No.81*, Oxford: Refugee Studies Center, p.29, available at: [http://www.rsc.ox.ac.uk/publications/working-papers-folder\\_contents/wp81-normative-assessment-frontex-190412-en.pdf](http://www.rsc.ox.ac.uk/publications/working-papers-folder_contents/wp81-normative-assessment-frontex-190412-en.pdf).

26 <http://frontex.europa.eu/news/update-to-joint-operation-hermes-2011-7DIILz>.

27 FRAN Quarterly, P.22.

or by members of different clans. Somalis and Eritreans reported using the same route through Ethiopia and Sudan.

The situation in the central Mediterranean route escalated with the drowning of 364 migrants near Lampedusa at the beginning of October 2013. This triggered visits of Commission's President Barosso to the island of Lampedusa, and reviewing European border management.<sup>28</sup> Italian Government sent predator drones alongside helicopters and warships in order to prevent any such disaster in the future.<sup>29</sup> As a result of the JHA Council meeting on 7-8 October 2013, a Task Force Mediterranean was established. At the meetings of this Task Force several priority steps were recommended: assistance and reinforced dialogue with countries of origin and transit; a renewed focus on resettlement and regional protection efforts; legal channels to safely access the European Union to be explored, as well as a general focus on increased resettlement efforts; the fight against trafficking and smuggling of human beings and criminal networks; ensuring a speedy and sustainable return of migrants in a humane and dignified manner and strengthening the management of the EU's external borders.<sup>30</sup> Already on October 11, Armed Forces of Malta (naval and air) rescued 147 migrants 50 nautical miles south of Lampedusa.<sup>31</sup>

### JOINT OPERATION INDALO

JO Indalo 2011 (May-December) and JO Indalo 2012 (May - October) were covering five zones of the south-eastern Spanish sea border and extending into the western Mediterranean. Participating states are Spain, Portugal, France, Italy, Luxembourg, Finland, Iceland, Belgium, Romania and United Kingdom. Overall, in 2012 there was a 4% decrease in the number of irregular migrants detected compared to the JO Indalo 2011.<sup>32</sup>

JO Indalo continued in 2013. It was coordinated by the National Coordination Centre in Madrid. Here daily meetings are held by the representatives of all participating Member States reviewing the activities of the past 24 hours and planning the activities of the patrols for the next 24 hours. Also coordination takes place in the Local Coordination Centre (LCC) in the Algeciras. Patrols were carried out by vessels and aircrafts, supported by the local headquarters of the Guardia Civil. Other Spanish agencies and bodies were included in the operation like Spanish Maritime Safety Agency, Customs Surveillance Service, The Spanish Navy, Intelligence Service against Organised Crime, Directorate - General of the Merchant Navy and the General Secretariat of the Sea.<sup>33</sup> Many European agencies were involved in the Operation like EUROPOL, European Maritime Safety Agency, European Fisheries Control Agency, Mediterranean area anti-drug enforcement coordination centre, Maritime Analysis and Operations Centre Narcotics, European Agency for Fundamental Rights and European Asylum Support Office. During 2013, 330 detections were made, 318 rescues, 8 arrests, and only 1 casualty. Significant results were achieved in curbing drug trafficking with the seizure of 25 tons of drugs and 60 smugglers being arrested. Also, over 50000 packs of cigarettes were confiscated and 12 smugglers were arrested.<sup>34</sup> The activities of the personnel of this operation continued to be affected by migratory flows mainly originating from North African and sub-Saharan countries, which follow a similar seasonal pattern.

### OPERATION AENEAS

Operation Aeneas was launched in April 2011 and initially was programmed to last until March 2012. The operation was located in the Central Mediterranean in order to curb the inflow of migrants in mainland Italy from Greece, Turkey and Egypt. Participating states were Denmark, Finland, France, Germany, Greece, Iceland, Luxembourg, Portugal, Romania, Slovakia, Spain and Sweden.<sup>35</sup>

From July 2012 to January 2013 the JO Aeneas was conducted in Apulia and Calabria.

<sup>28</sup> <http://www.euractiv.com/development-policy/questions-rise-eurosur-frontex-l-news-530955>.

<sup>29</sup> <http://www.thetimes.co.uk/tto/news/world/europe/article3895522.ece>.

<sup>30</sup> Communication from the Commission to the European Parliament and the Council on the Work of the Task Force Mediterranean, COM(2013), 869 final, Brussels, 4.12.2013.

<sup>31</sup> <http://www.youtube.com/watch?v=XEtNvMMwOPO>.

<sup>32</sup> FRAN Quarterly, 2012, Q4, p.24,

<sup>33</sup> Guardia Civil, *EPN Indalo Operation 2013*, retrieved from: <http://www.youtube.com/watch?v=xpCjxFcqq4>.

<sup>34</sup> Ibid.

<sup>35</sup> <http://frontex.europa.eu/operations/archive-of-operations/9brAHJ>.

Overall, the percentage of incidents which involved departures from Greece was as high as 78%. However, from August 2012 onwards the number of illegal immigrants dropped due to the Greek police operation Aspida. On the other hand, Greek police operations in the centre of Athens and in other cities resulted in expelling illegal migrants out of Greece. UN Special Rapporteur on the human rights of migrants noted that this operation inflamed the influx of migrants through the islands in the Aegean Sea.<sup>36</sup> From here, the migrants arrive in Apulia and Calabria with pleasure boats.

In 2013, detections in Italy tend to be associated with different movements of irregular migration. Most of the detections in the area of Apulia are linked to secondary movements from Greece to Italy, while most of the detections in Calabria are associated with migrants who departed from Turkey or Egypt, sailed across the Aegean Sea, often near Crete, towards Italy. In this area, the JO EPN Aeneas 2013 started on 3 June and was scheduled to run until 30 September 2013. The Operational Plan defined that the mission will cover Apulia and Calabria, and the shores of the Ionian Sea and part of the Adriatic Sea. Detections of illegal migrants in the second quarter of the year in Apulia were much lower than detections in Calabria. Most of the migrants located in Apulia were coming from the island of Corfu. The trend most migrants to be nationals from Asia and Middle East.<sup>37</sup> In most cases, Athens was the centre for organizing the trip, with facilitation networks offering various options for various prices. Reports from JO EPN Aeneas 2013 show that the number of migrants illegally crossing the Ionian Sea from Greece to Italy was decreasing in the recent months. This is due to the preference of migrants to travel from Greece to EU via Western Balkan countries.

In August 2013 within operation Aeneas air surveillance operations began with one Air Force Malta King Air maritime patrol aircraft which was replaced by a second team on September 2013. This aircraft mainly carried out night patrols with high success rate in preventing illegal migrants and contraband at sea. The Maltese crew even detected a boat smuggling narcotics to Albania.<sup>38</sup>

### JOINT OPERATION POSEIDON SEA

JO Operation Poseidon started in 2011 and was replacement for the RABIT operation in Greece that lasted from November 2010 to March 2011. The sea part of the Operation was aimed to control the Greek islands in the Aegean Sea, including Crete. This was due to the highly volatile situation in the North Africa. Besides curbing the flow of illegal immigrants, during the first half of 2011 the servicemen of the operation detected two cigarette smuggling channels.<sup>39</sup>

The JO Poseidon Sea 2012 was focused on tackling the flow of irregular migrants from Turkey and Egypt which landed on Greek islands. The vessels departed mainly at night because as a determinant of the course they used the lights from the islands.

The JO Poseidon Sea 2013 has the same geographical remit. The intensity of operational activities led to a rapid and sustained decrease in flow of immigrants. This particularly is valid for the borders with Turkey. In the second quarter 2013, detections in the Aegean Sea were the largest on this route, but overall detections were significantly lower than in 2012. Again, as in 2012 Syrians were by far the most detected nation (although in significantly lower numbers than in 2012). Most of these detections were in the Eastern Aegean Sea region,

The influx of immigrants had risen with the beginning of the holiday season on the Greek Islands. Usually they mixed with the other EU citizens returning home after the holiday in Greece, using forged documents and travelling with airplanes to the wanted EU destination. As a rule, all were heading for Sweden or Germany to claim asylum.<sup>40</sup>

<sup>36</sup> <http://www.ecre.org/component/content/article/70-weekly-bulletin-articles/354-frontex-detections-for-unauthorised-border-crossings-hit-record-low-in-2012-.html>.

<sup>37</sup> FRAN Quarterly, Quarter 2, April – June 2013, p.21.

<sup>38</sup> <http://maltatoday.com.mt/en/newsdetails/news/national/Armed-Forces-air-wing-in-Frontex-Operation-Aeneas-20130903>.

<sup>39</sup> FRAN Quarterly, Quarter 2, 2011, p.34.

<sup>40</sup> FRAN Quarterly, Quarter 2, April – June 2013, p.26.

## CONCLUSION

By depicting and comparing recent operations in the Mediterranean carried out by FRONTEX and various Member States of the European Union, as well third states, this article has shown that the control of the illegal immigration on the most porous sea border of EU – the Mediterranean sea border is well established. These operations contributed not only by curbing the influx of illegal immigrants, but also in diminution of the smuggling activities of weapons, drugs, cigarettes and contraband. These operations were extremely important having in mind the explosive situation in the North African countries and the Arab World since the onset of the so called Arab Spring, the situation in Libya as well the current situation in Syria. Nevertheless, besides the migrants from these countries significant problem pose the migrants from Afghanistan and Pakistan as potential asylum seekers, and the duty of EU and its agencies to respect international law on the rights of refugees especially the principle of non – refoulement. However, evidently FRONTEX operations in general (not only sea operations) have always been at odds with respecting international law and that is a issue that was addressed in the recent amendments of the FRONTEX Regulation in 2011 (arts.1, 2, 5 and 26a) and the results in practice are yet to be seen. Furthermore, besides its preventative and return operations, FRONTEX operations contribute to the safety of potential immigrants at sea in a event of a distress, since patrols in the framework of the different joint operations saved many lives of migrants often sailing with risky small wooden, fish or even toy inflatable boats. These rescue operations will be even more successful with the recent initiatives in the JHA Council drones to be used in order to establish more detailed scan of the situation in the Mediterranean.

After several sea operations were launched, already in 2010 FRONTEX announced that the number of apprehended migrants dropped by 73 % in comparison with 2009. This trend continued in the following years. According to the Risk Analysis 2013 FRONTEX sea operations (Hermes, Aeneas, Poseidon) have significantly reduced the numbers of detections in the Mediterranean. For instance, the Central Mediterranean route in 2012 noted a drop by 82 % of detections in comparison with 2011, the Eastern Mediterranean route drop of 35% for the same period, the route to Apulia and Calabria drop of 9%, the Western Mediterranean route drop of 24 % and the Western African route to the Canary Islands drop of 49%.<sup>41</sup>

It can be concluded that by the frequency, the scope and the success rate of the joint sea operations, FRONTEX significantly contributed to the implementation and realization of the goals of the EU Asylum and Migration Policy, as well as overall security of the EU Maritime borders.

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<sup>41</sup> FRONTEX, Annual Risk Analysis 2013, p.22.



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## SEXUALLY DEVIANT BEHAVIOUR OF ADOLESCENTS

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**Abstract:** In domestic literature there is a multitude of papers in which sexual assaults are studied from legal, criminological, sociological, and psychological point of view. They are mostly related to the sexual delinquency of adults, which means that there are very few studies dealing with the sexually deviant behaviour of adolescents. However, this issue is certainly an area as important as the issue of sexual delinquency of adults, especially because the psychotherapeutic treatment can reduce sexually deviant behaviour. For this reason, questions related to the sexual delinquency of adolescents are firstly discussed at the appearance level in order to form a more complete picture of the range, dynamics and its possible trends in the future.

The analysis included 520 rape cases committed in the area of the Republic of Serbia in the period from 2008 to 2012. It was found that 409 offenses (79%) were committed by adults and 111 offenses (21%) were committed by young persons aged from 12 to 20. Most crimes (26%) were committed in 2012, while the lowest number of crimes (16%) was committed in 2009. The analysis of age structure showed that most sexual crimes, namely 35%, were committed by sex offenders aged from 16 to 20. However, it is also important to note that there is a significant proportion of juveniles aged 14 to 15 (26%), as well as children under 14 (4%).

This analysis enabled the assessment of subject issues on a global level, providing insight into the sexually deviant behaviour among adolescents in our region. The present analysis is insufficient because it does not include data on the etiology of adolescents' conduct disorder (environmental and personality related factors) which are essential in the treatment of behavioural disorders. For this reason, in the future a work on the systematic construction of scientific knowledge as the basis for the development of tertiary prevention programs is needed, based on the fundamental postulates of cognitive psychotherapy, whose ultimate goal would be the reduction of sexual deviant behaviour of adolescents.

**Keywords:** sexually deviant behaviour, prevention program for adolescents, cognitive psychotherapy

## INTRODUCTION

In domestic literature there is a multitude of research papers, monographs and articles in which sexual offenses are considered from legal, criminological, sociological and psychological point of view. Previous researches were largely related to the sexual delinquency of adult individuals, which means that there are very few studies that deal with sexually deviant behaviour among adolescents. However, this issue is certainly an area as important as the issue of sexual delinquency of adult persons. Questions related to the sexual delinquency of adolescents should be considered in order to form an objective knowledge that could be practically applied in the prevention of this type of delinquency, as well as in their treatment. The need for prevention and treatment primarily stems from the fact that adolescents as sexual offenders represent an alarming risk to the community. Secondly, this need stems from the fact that as many as 50% of all adult sexual abusers began abuse in adolescence. And finally, due to the fact that the gravity of delinquent behaviour may escalate if there is no treatment and intervention during adolescence (Perry, Orchard, 1992).

In the literature there is some confusion regarding the distinction between the notion of a sex offender and a sexually deviant individual that requires consideration. Sexual deviation or

perversion involves a form of sexual behaviour that deviates from the existing social norms and is seen as pathological in a given culture. Sexual offenders are not always sexually deviant or perverted, but may suffer from some form of mental disorder (Kron, 1992). The sexual delinquency is defined as coercive and non-coercive sexual act that involves oral, vaginal or anal penetration; in some cultures it includes sexual assault and other forms of behaviour, such as sexual touching (Davis, Leitenberg, 1987; Chaffin, Bonner, Pierce, 2003).

Adolescence is a period of transition from childhood to adulthood, which lasts approximately from the age of 12 to 19 or 20, when physical development is practically complete and during which a young person sexually matures (Smith, Edwards, Nolen-Hoeksema, Fredrickson, Loftus, Geoffrey, Bem, Darly & Maren, 2003). However, children are considered too young to be able to voluntarily engage in sexual activity, which is the reason that such behaviour is considered as a serious offense, whether used force or coercion or not (Davis & Leitenberg, 1987; Chaffin, Bonner & Pierce, 2003). Currently, there is no theory that can provide a satisfactory answer to the question of why someone becomes sexually deviant. Experts consider the etiology of the disruptive behaviour disorders in many ways, but primarily in terms of environmental and personality related factors. Basically everyone agrees that an early experience has a great importance for the development of personality in general, and thus also for sexual functioning (Kron, 1992). Questioning of environmental factors' influence showed that occurrence of sex offence is related to the experience of sexual and physical abuse, neglect and exposure to domestic violence. On the other hand, the results of other studies show that there is no significant correlation between sexually violent behaviour in adolescence and early experience of sexual abuse, but there is a relation to parental behaviour i.e. psychological rejection and isolation (Howitt, 2009; Haapasalo & Kankkonen, 1997). Such behaviour includes the parents being more negative and hostile, more prone to diminish children's importance, ignoring their needs, isolating them from other people or threatening to hurt them (Haapasalo & Kankkonen, 1997).

The juvenile sexual offence is characterized as a wide range of different behaviours. Hunter (2000) points out that the juvenile sexual offenders are primarily characterized by:

- time of the crime at the age from 13 to 18,
- pronounced difficulties with impulsivity and judgment,
- more than 80% of the pattern files have been diagnosed with psychiatric disorders,
- 30-60% of cases have a learning disability,
- 20-50% of cases have a history of physical abuse,
- 40-80% of cases have a history of sexual abuse.

Adolescents are also more likely to choose female victims. The victims are usually young children whom they already know. Adolescents are less physically violent than adult sexual abusers. Approximately 40% of adolescents showed strong aggression towards the victim peer or adult. However, the harassment of children is relatively common pattern of adolescents' behaviour, which is confirmed by studies on juvenile sex offenders. They found that offenders resort to sexual abuse of children much younger of themselves (Worling according to Howitt, 2009).

Although there is no unique typological character of sexual offenders, some authors such as Perry & Orchard (1992), described the following types:

1) *naïve experimenter* - a person aged from 11 to 14, which previously showed inappropriate behaviour. They described this type as sexually naïve that engages in one or two sexual act with a child under the age of age from 2 to 6 without the use of force or threats.

2) *under-socialized adolescent* - is socially isolated and inept person. Violent behaviour of this type is usually chronic and includes handling, rewarding and using certain circumstances. It is motivated by the desire for greater private value and intimacy.

3) *pseudo-socialized adolescent* – is a person who has good social skills, behave appropriately and may seem confident. This person may be a victim, and may have been suffering from some form of abuse in childhood that lasted for years. The sexual offence is motivated by the desire for sexual pleasure through exploitation. The adolescent is prone to rationalization and does not feel guilt or remorse.

4) *sexually aggressive* – this type comes from abusive and chaotic family and has a longer history of delinquent behaviour. Poor control and impulsivity in the manifestation of sexual assault is commonly followed by the usage of narcotics. Their sexual assaults involve coercion. The sexual offence is motivated by the desire to achieve power, domination, expressing anger and humiliation of the victim.

5) *sexually compulsive* - this type of adolescent comes from an emotionally repressive and rigid family. Their violations are often compulsive in nature, whereby the inclined voyeurism, or some form of exposure. The sexual offence is motivated by the desire to ease anxiety.

6) *disturbed and impulsive* - this type of adolescent probably has a history of psychological disorders, severe family dysfunction, excessive usage of narcotics and a significant learning disability. Impulsive offenses are reflected in the chaotic experience of reality.

7) *affected groups* - this type of perpetrator can be a younger teenager without prior delinquent history, which is to attack the company engages in peer groups. The sexual offence is often motivated by peer pressure and the desire for approval.

Clinical classification of juvenile sex offenders is differentiated with respect to the age of the victim, the social and criminal history and pattern of attack. Bonner (2005) points out that a landmark for adolescents as perpetrators of sexual violence against children is lower mental functioning which includes: under-developed social skills, depression, anxiety, pessimism, expressing less aggressive in sexual assault, less frequent use of firearms and less likelihood that they are under the influence of narcotics. For adolescents as perpetrators of sexual violence against peers and adults, according to Bonner (2005), a characteristic is that their victims are more often female than male, they are more violent and aggressive, and they are more likely to have been under the influence of narcotics, are often threatened to use a weapon, and rarely had been arrested and prosecuted for non-sexual offenses.

#### **Recidivism and treatment of sexual offenders**

Official statistics show that the rate of recidivism of persons that committed sexual assault was between 40% and 55%. However, meta-analysis by Hanson and Bisijerove that included 61 longitudinal studies in which were included 29,000 sex offenders followed from 4 to 5 years, showed that the recidivism rate was about 13% for sexual assault, and about 12% for others (Milovanović, 2005). The researchers concluded that relevant predictors of recidivism are:

- antisocial personality,
- lack of directing attention to the potential importance of social deviance,
- criminal history.

The treatment of sexual offenders surely is an issue that requires a special consideration. Experts in this subject recognize that the treatment of sexual offenders should decrease sexual

arousal and the level of testosterone that is usually accompanied with a strong sex drive and sexual aggression. Nevertheless, there are polemics about the physical or chemical castration. Various studies that examined effects of physical castration on recidivism showed that it occurs in the range of 2% to 4% but it is also found that approximately 10% of castrated people continue to have an erection, and some of them even had a higher percentage of sexual activity after castration (Milovanović, 2005).

The research of drug treatment whose primary objective was to reduce the hormone testosterone also showed that it does not contribute to the reduction of recidivism rate of sexual offenders.

On the other hand, the survey conducted at the clinic in Portland in 1971 showed results of the successful treatments of sex offenders. The study involved about 5,000 sex offenders who underwent treatment that included exercise for the reduction of deviant arousal, learning social skills, masturbating on normal fantasies and other therapeutic techniques. Among 3,800 sex offenders 91% of cases that completed treatment period from 1 to 17 year were successfully treated (Milovanović, 2005).

In the last twenty years research of juvenile sex offenders are focused primarily on defining and determining their characteristics in order to design the efficient prevention and treatment programs. It is found that this behaviour represents a disorder that may not have the characteristics of pathological disorders, and in that sense most adolescents could safely live in the community, especially if they are involved in treatment. Recidivism rates are significantly lower among those adolescents who were involved in the treatment.

Based on the above, we conclude that the prevention or reduction of recidivism of sex offenders needs the most appropriate set of measures and activities. It is important to analyze, from objective and subjective sides, the range, dynamics and conditions related to the manifestation of such crimes, as well as the relationships of the offenders with other people, their behaviour, mental disorders, etc.

### **OBJECTIVE**

The overall goal of this research is to perform the analysis of the frequency of sexual offenses at the territory of the Republic of Serbia carried out in the period from 2008 to 2012, by persons aged from 12 to 20 (adolescents) in order to form a more complete picture of its range, dynamics and eventual trends in the future.

### **METHOD**

All analyses were performed on data on the number of rape cases in the Republic of Serbia in the period from 2008 to 2012, by adults and persons aged from 12 to 20 (adolescents). Data were obtained from the Department of Analytics of the Ministry of Internal Affairs of the Republic of Serbia.

### **RESULTS**

Based on the analysis of the number of sexual offenses committed in the period from 2008 to 2012, it was found that out of 520 reported acts of criminal offense, 409 (79%) of criminal offenses was committed by adults and 111 offenses (21%) was committed by minors (Chart 1).

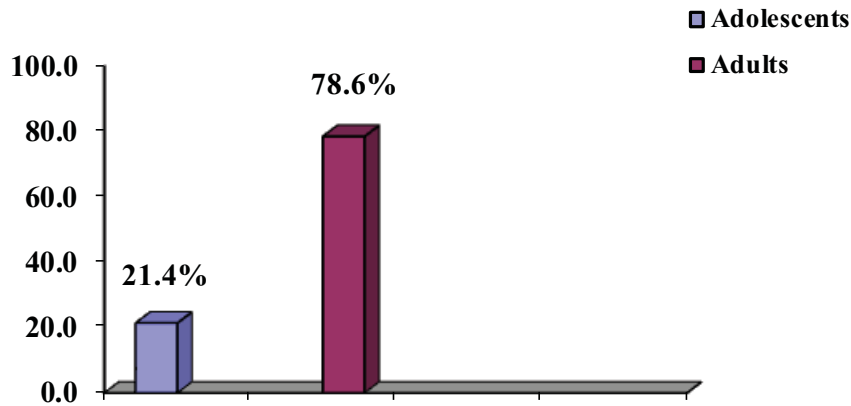


Figure 1 Analysis of the number of sexual offenses committed in the period 2008-2012

The analysis of the number of crimes of rape for each year during the researched period has been done (Figure 2). During 2008, out of 124 totally reported offenses 96 offenses (77%) were committed by adults, while 28 crimes (23%) were committed by adolescents. During 2009, out of 127 totally reported offenses 107 offenses (84%) were committed by adults, while 20 crimes (16%) were committed by adolescents. Compared to 2009 there was a decrease of the number of reported rape cases in 2010. Specifically, in 2010, out of 89 totally reported acts of criminal offense, 66 offenses (74%) were committed by adults and 23 offenses (26%) were committed by adolescents. During 2011, out of 89 totally reported criminal acts 73 offenses (82%) were committed by adults and 16 offenses (18%) were committed by adolescents. Finally, in 2012, out of 91 totally reported criminal offenses 67 crimes (74%) were committed by adults and 24 offenses (26%) were committed by adolescents. Most crimes were committed in 2012 (26%), while the lowest number of crimes was committed in 2009 (16%).

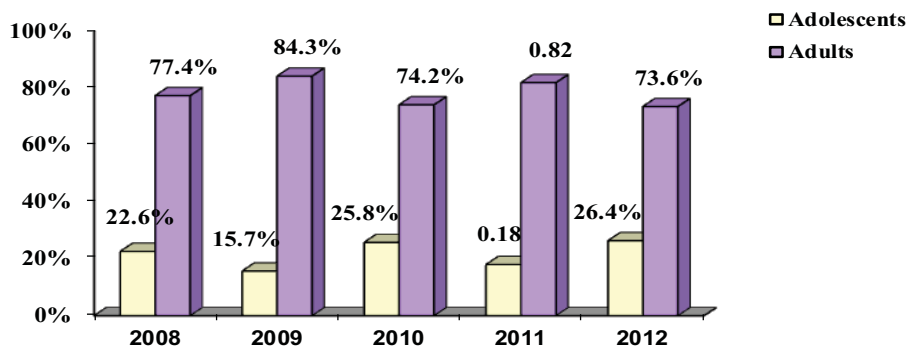


Figure 2 Comparison of crimes of rape committed by juveniles and adults for the period 2008-2012

The analysis of offenders' age structure which included age categories from 12 to 20 showed that 4% offenses of rape were committed by persons under the age of 14, 26% by the age of 14 and 15, 35% by the age of 16 and 17, and 35% by juveniles aged 18 to 20 (Figure 3). Thus, these statistics show that the highest percentage of rape cases was committed by older juveniles aged 16 to 17, as well as by young adults aged between 18 and 20 (Figure 3).



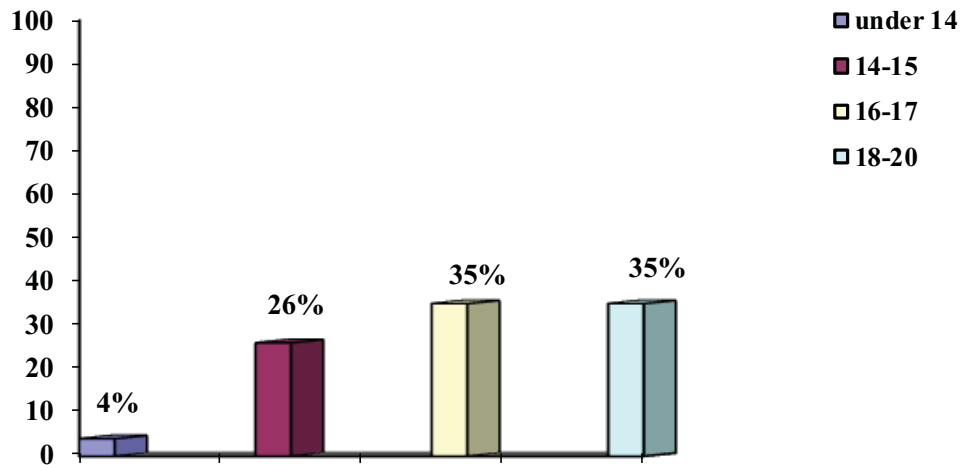


Figure 3 Structure of minors registered as perpetrators of criminal acts rape in the period 2008 - 2012

## DISCUSSION AND CONCLUSION

According to official data, in many developed countries adolescents took large share in the total number of sex offenders. In fact, in the UK, 30% of rape crimes against adult women and almost 50% of all sexual assaults were committed by sex offenders who were under 18. The data from the US showed that 50% of sexual offenses against boys and 25% against girls were committed by adolescents. Moreover, juvenile sex offenders are also relatively numerous in the total number of sex offenders in Sweden, which among others confirmed Langstrom. According to the results of this research, over 10% of rape, sexual harassment, abuse and sexual harassment of children, is associated with offenders of juvenile age. This percentage could be higher in Sweden because children in age younger than 15 cannot be prosecuted or subjected to the competency evaluation (Howitt, 2009).

If we compare these results with the results of the presented study, we can conclude that the participation of adolescents in this type of assault on the territory of the Republic of Serbia is very significant (21%). The most common sexual crimes were committed by older juveniles (35%) and young adults (35%), but also a significant participation of younger juveniles (26%) of the total number of sexual offenses committed by adolescents. A reason for particular concern is the fact that as many as 4% of sexual crimes were committed by children at the age of 12 to 14.

If we bear in mind the importance of this issue and the fact that sexually deviant behaviour could escalate if proper measures and activities are not taken, as a priority there is a requirement for prevention and treatment. In this regard, data on the extent and dynamics of these types of crimes should be completed with data on the etiology of conduct disorder adolescents including factors related to personality and environmental factors which are necessary for the adequate treatment of behavioural disorders. As we have pointed out in the introduction, the problem of deviant sexual behaviour of adolescents should be considered from the objective and the subjective side, thus from the aspects of conditions conducive to the performance of this type of assault, as well as on the side of the factors that are related to the offender, behaviour, mental disorders, etc.

It is also important to point out, that the demand for the development of prevention programs is increased by the fact that there is relatively small number of them in this issue. The assessment and treatment of juveniles' sexual bullies should be very thorough and complex. It should be based on the clinical researches and confirmed techniques. There is small number of research projects that suggests how to assess and treat this category of offenders, but all point out need for identifying and treatment sexual bullies as the symptom emerge, rather than having patterns

of behaviour deeply rooted and resistant of treatment. The precise evaluation of the functioning of the juvenile sexual abusers requires an assessment of their emotional, cognitive, behavioural, and interpersonal aspects of life. In addition to the above, treatment should certainly be focused on the development of sexual skills, channeling sexual urges towards normal, i.e. reducing their deviant fantasy (Perry & Orchard, 1992).

Although there are serious difficulties in the preparation of adequate prevention programs, they should include informing of target group about the issue of sexual violence, then the recognition and avoidance of high-risk situations, initiating social marketing to raise the level of awareness of self-protection, training of police officers to focus on victims' issues, providing useful advice to potential victims in order to effectively avoid rape situations, or giving legal advice and guidance on possible treatments or forms of self-help injured victims (Martinjak, 2011). These prevention programs could be designed for different target groups, which can be determined by:

- the age of the victims,
- place of residence or domicile,
- gender,
- potential perpetrators,
- citizens in general,
- staff and volunteers in non-government organizations, and so on.

On the other hand, existing models of treatment of sexual abusers typically include individual and group work, and are focused on features of the cognitive and behavioural characteristics. Prevention programs should be based on the fundamental postulates of cognitive psychotherapy, where it would be purposeful to pay attention to the prevalence of sexual assaults, victim selection, motivation and the use of defense mechanisms. However, the treatment model that shows positive changes in the behaviour of adolescents is multisystem therapy (MST), whose primary goals are to assist parents to independently cope with the difficulties that arise in the education of adolescents, and to be significant support in dealing with a family and other problems (Miner & Coleman, 2001). In this sense, multisystem therapy is dealing with cognitive, family, and other environmental factors that are generally associated with antisocial behaviour amongst young people, including sexual delinquency (Miner & Coleman, 2001).

One important problem linked to the issues of sexually deviant behaviour is the question of the estimation of risk from the repetition of sexual offense. This assessment involves primarily the application of a series of psychological tests to determine the extent to which the sex offender is ready or inclined to repeat offending, and what are the segments that should be treated (Prentky & Righard, 2003).

Recognizing that the prevention should include a common set of activities, it is necessary to engage all social subjects in his work dealing with this problem. Sexual delinquency in general should not be viewed in isolation, but from the perspective of the police and judiciary. This is certainly a problem in which other social subjects should also take responsibility and accept the fact that sexual delinquency is an important social problem.

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#### ATTACHMENTS

	2008		2009		2010		2011		2012		In total	
	N	%	N	%	N	%	N	%	N	%	N	%
Adolescents	28	22.6	20	15.7	23	25.8	16	18	24	26.4	111	21.4
Adults	96	77.4	107	84.3	66	74.2	73	82	67	73.6	409	78.6
In total	124	100	127	100	89	100	89	100	91	100	520	100

Table 1 Analysis of the number of sexual offenses committed in the period from 2008 to 2012

	2008		2009		2010		2011		2012		In total	
	N	%	N	%	N	%	N	%	N	%	N	%
Adolescents	28	22.6	20	15.7	23	25.8	16	18	24	26.4	111	21.4
Adults	96	77.4	107	84.3	66	74.2	73	82	67	73.6	409	78.6
In total	124	100	127	100	89	100	89	100	91	100	520	100

Table 2: Comparison of crimes of rape committed by juveniles and adults from 2008 to 2012

	2008		2009		2010		2011		2012		In total	
	N	%	N	%	N	%	N	%	N	%	N	%
Under 14	-	-	1	0.8	2	2.2	-	-	1	1.1	4	4
14-15	7	5.6	3	2.4	9	10.1	5	5.6	5	5.5	29	26
16-17	12	9.7	9	7.1	4	4.5	3	3.4	11	12.1	39	35
18-20	9	7.3	7	5.5	8	9.0	8	9.0	7	7.7	39	35
In total	28	25.2	20	18	23	20.7	16	14.4	24	21.6	111	100

Table 3 Structure of minors registered as perpetrators of the rape crime in the period from 2008 by 2012

## EQUITY IS NOT EQUALITY: WOMEN IN PRISON SYSTEM IN BOSNIA AND HERZEGOVINA<sup>1</sup>

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**Abstract:** Pertinent surveys confirm important characteristic of prison systems around the world that they are designed for male prison population, whereas the needs of women prisoners are largely disregarded despite of the fact that important transnational reports instruct establishment of diverse gender biased conditions in prisons. B&H is not exception in this regard, since the prison systems in B&H are designed for the majority of the male prison population. This is evident from the architecture of prisons, established security procedures and facilities for healthcare, family contact, work and training. Therefore, in the focus of this paper, based on a comprehensive study, is important question: whether the identical conditions in male and female prisons (sections of prisons) in B&H provide equality and equity of women in its true sense. Addressing this question is essential not only for effective elimination of inequality of women in prison system of B&H but it is also necessary in order to draw the attention of society on this ignored and vulnerable category of prisoners.

**Keywords:** prison system, women prisoners, equality and equity

### INTRODUCTION AND METHODOLOGY

Female prisoners are marginal prison population, constituting less than 10% of national prison populations.<sup>2</sup> In Europe, Spain has the highest percentage of women in prison (almost 8%) and Azerbaijan the lowest (less than 1.5%).<sup>3</sup> In Bosnia and Herzegovina (B&H) data from SPACE<sup>4</sup> study from 2008 to 2010 indicates analogous developments.<sup>5</sup> Nevertheless, the female prison population is dramatically increasing.<sup>6</sup> The rate of increase in the number of women in prison is much greater than that for men.<sup>7</sup>

1 This paper is based on the results of a broad empirical study on equity and equality of women in prison system in B&H, which is a part of OSF B&H Policy Development Fellowship Program.

2 See: Quaker United Nations Office. (2011). Briefing on the UN rules for the treatment of women prisoners and non-custodial measures for women offenders ('Bangkok rules'). Geneva - New York: Quaker United Nations Office.

3 Walmsley, R. (2006). *World female imprisonment list*. London: International Centre for Prison Studies and WHO Regional Office for Europe. (2009). *Prison health database [online database]*. Available at: <http://data.euro.who.int/HIP>.

4 See: Council of Europe Annual Penal Statistics, SPACE (Statistiques Pénales Annuelles du Conseil de l'Europe). Available at: <http://www3.unil.ch/wpmu/space/space-i/>.

5 Council of Europe, Université de Lausanne. (2010). *SPACE I & II*. Lausanne: ICDP/ESC, UNIL-Sorge, p 80.

6 This is attributed to stringent responses to the non-violent crimes for which women are typically arrested. See: (Penal Reform International, 2007).

7 Bastick, M. (2005). *A commentary on the standard minimum rules for the treatment of prisoners*. Geneva: Quaker United Nations Office. For examples from different countries see: Prison Reform Trust. (2006). *Bromley briefings prison factfile*. London: Prison Reform Trust; Quaker United Nations Office. (2008). *Women in prison - A commentary on the UN Standard Minimum Rules for the Treatment of Prisoners*. Geneva - New York: Quaker United Nations Office; and Frost, N. A. et al. (2006). *HARD HIT: The Growth in the Imprisonment of Women, 1977-2004*. Institute on Women

Usually, women are imprisoned for non-violent, property or drug-related offences.<sup>8</sup> Similar situation is in B&H where according to the data from Statistical yearbooks of Federation of Bosnia and Herzegovina (FB&H)<sup>9</sup> and Republic of Srpska (RS)<sup>10</sup> 83% of women are imprisoned for non-violent and property offences. Furthermore various researches show that imprisoned women constitute a vulnerable group due to a prior substance and/or alcohol addiction and history of sexual abuse and violence etc.<sup>11</sup> which highlights the need to provide suitable prison environment where those conditions can be properly treated.

Regardless of the fact that different needs of women prisoners are well recognized in various international reports and documents<sup>12</sup> national prison systems are predominantly created for the male prison population, consequently resulting in equal treatment of women and men. Regrettably, the position of female prisoners in prison system of B&H is relatively unexplored topic in existing national scholarships. Having above mentioned in mind, this study attempts to fill this void through the analysis of the certain characteristics of women imprisonment in B&H.

Sensitive nature of the research matter as well as constraints and challenges that usually accompany prison researches necessitated an equally complex methodology<sup>13</sup> which combines: analysis of relevant provisions of the international documents and pertinent national legislation,<sup>14</sup> semi-structured qualitative interviews<sup>15</sup> and focus groups<sup>16</sup>. Interviews were based on previously prepared, unrestricted (i.e. open-ended) questions regarding specific issues. The perception of women prisoners was explored through focus groups in both prisons that allowed comparison of conditions in women prisons of two entities. The reasons for choosing focus groups as a means for data collection are eloquently expressed by Robson: They are 'a highly efficient technique for qualitative data collection since the amount and range of data are increased by collecting from several people at the same time'.<sup>17</sup>

Data acquired through structured qualitative interviews and focus groups were supplemented with critical examination of the provisions of international documents and provisions of state and entities legislation on execution of criminal sanctions. Combination of thematic<sup>18</sup> and content analysis was crucial in analyzing the acquired data.<sup>19</sup>

The use of several methods and sources contributed to the validity and reliability of results. Also the technique of triangulation was used in order to accomplish reliability of the research findings.

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13 See: Lucic-Catic, M. (2011). 'Challenges in Conducting Prison Research'. *Criminal Justice Issues* (5-6), pp 59-73.

14 Law on execution of criminal sanctions of Republic of Srpska (Official Gazette of RS, 85/2005, 72/2009 & 31/2011), Law on execution of criminal sanctions of Federation of B&H (Official Gazette of FB&H, 13/98) and Law on execution of criminal sanctions of B&H (Official Gazette of B&H 13/05, 53/07, 97/07).

15 The interviews conducted with: wardens of the prisons, treatment staff and members of the health service, security service and disciplinary commissions.

16 Women prisoners focus groups.

17 Robson, C. (2002). *Real World Research*. Oxford: Blackwell Publishing

18 Huberman, M., & Miles, M. (1994). Data Management and Analysis Methods. In N. Denzin, & Y. Lincoln (Eds.), *Handbook of Qualitative Research*. London: Sage Publications Inc.

19 We opted for this combination in order to eliminate the risks of ignoring context and multiple meanings inherent to the content analysis.



## PRISON SYSTEM IN B&H

Current situation in prison system in B&H is burdened with a various difficulties. Namely, after dramatic changes in the B&H legal system on June 23<sup>rd</sup> in 2008 at the session of the Council of Ministers of B&H, 'Bosnia And Herzegovina Justice Sector Reform Strategy 2008 – 2012' was adopted with the main objectives and a set of agreed strategic programs and activities. These have been important achievements but analysis of the 'Action Plan for the Implementation of the Justice Sector Reform Strategy in Bosnia and Herzegovina (2009 – 2013)'<sup>20</sup> 'Report on Implementation of the Justice Sector Reform Strategy in Bosnia And Herzegovina and its Action Plan For 2012'<sup>21</sup>, as well as two revised B&H JSRS AP have shown that in terms of women prisoners any activities has not been undertaken or planned.

At the same time progressive legal framework in the field of gender equality on a state and entity level was established. But, overview of programs and activities of BH JSRS in the area of execution of criminal sanctions, legal framework for the execution of criminal sanctions and legal framework in the field of promoting and protecting women's human rights confirms that the question of equity of women in prison system of B&H is resolved superficially without taking into consideration that equal treatment of women and man in prison is not equity in its true sense.

Contemporary prison system in B&H is characterized with disintegration of legislative and institutional framework. Legislative framework for execution of criminal sanctions in all four jurisprudences in B&H generally is not gender sensitive. Only few provisions address special needs of imprisoned women related to pregnancy and motherhood. Beside those provisions other specific needs of women are not recognized and resolved in the existing legislative solutions. Based on fragmented legislative framework, execution of criminal sanctions is spread across four jurisdictions under the respective Ministry of Justice.<sup>22</sup> At the state level prison is in the process of the construction and only detention unit currently operate. In the FB&H there are eight penal institutions,<sup>23</sup> while in RS six.<sup>24</sup> All of those institutions are designed and intended for the imprisonment of men. Women are imprisoned only in a Section for women of Prison in Tuzla (FB&H) and Kula (RS).

Therefore, it is obvious that complex prison system in B&H is created for the male prison population. This problem is identified in various international reports<sup>25</sup> while national reports as well as academic literature do not pay any particular attention to women in prisons. Bearing in mind all the above mentioned, it is necessary to take urgent actions to improve present state in women's prison facilities in order not only to achieve equality and equity of women in prison system of B&H but also to draw the attention of society to this ignored category of prisoners.

20 Bosnia and Herzegovina Ministry of Justice. (n.d.). *Action Plan for Implementation of the Justice Sector Reform Strategy in Bosnia and Herzegovina (2009 – 2013)*. Retrieved October 22, 2011, from Bosnia and Herzegovina Ministry of Justice: [http://www.mpr.gov.ba/userfiles/file/Strate%C5%A1ko%20planiranje/15\\_%20Action%20Plan%20for%20JSRS\\_Final.pdf](http://www.mpr.gov.ba/userfiles/file/Strate%C5%A1ko%20planiranje/15_%20Action%20Plan%20for%20JSRS_Final.pdf)

21 Bosnia and Herzegovina Ministry of Justice. (2010). *Report on Implementation of the Justice Sector Reform Strategy in Bosnia And Herzegovina and Its Action Plan For 2010*. Retrieved October 22, 2011, from Bosnia and Herzegovina Ministry of Justice: <http://www.mpr.gov.ba/userfiles/file/Strate%C5%A1ko%20planiranje/EJ%20%20Izvjestaj%20o%20provodjenju%20SRSP%20u%20BiH%20i%20njenog%20AP%20za%20period%20I-VI%202010.pdf>

22 It is important to underline that in the Brcko District of B&H operates only detention unit while imposed sanction will be executed in prisons in the entities based on the Memorandum of Understanding between the Brcko District of B&H and its entities.

23 Those prisons are: KPZ Sarajevo (male prisoners), KPZ Sarajevo - department of Ustikolina (male prisoners), KPZ Tuzla (male prisoners, Section for the minors and a Section for women), KPZ Tuzla –department of Orašje (male prisoners), KPZ Mostar (male prisoners), KPZ Zenica (male prisoners and a Section for the minors), KPZ B&Hać (male prisoners), KPZ Busovača (male prisoners).

24 Those prisons are: KPZ Kula (male prisoners, Section for the minors and a Section for women), OZ Doboj (male prisoners), OZ Foča (male prisoners), OZ Trebinje (male prisoners), OZ Bijeljina (male prisoners) and OZ Banja Luka (male prisoners).

25 See: Council of Europe (2004). 'Report of visit to prison establishments in the FB&H and RS on behalf of the Council of Europe' and Council of Europe – Field Office Sarajevo. (2004). *Health Care Assessment of the prisons of Bosnia and Herzegovina*. Sarajevo: Council of Europe – Field Office Sarajevo.



## ANALYSIS OF RESEARCH FINDINGS

### GEOGRAPHICAL POSITION AS A FACTOR OF GENDER BASED DISCRIMINATION

Geographical dispersion of prisons for women is one of the indicators of the gender based discrimination<sup>26</sup> that is recognized also by Louise Arbour (former UN High Commissioner for Human Rights) who stated: *'Women ... suffered greater family dislocation than men, because there are so few options for the imprisonment of women.'*<sup>27</sup>

As previously explained, in B&H there are only by one section for imprisonment of women within correctional facilities for men in each entity (KPZ Tuzla and OZ Kula) that by certain extent represent gender based discrimination. Namely, existence of institution for imprisonment of women at only one location in entity in most cases generates situations that women are located far away from their residence and that directly affect their possibility of maintenance of family and social contact.<sup>28</sup> Even though women prison population in B&H is rather low in comparison to male that cannot be used as justification for deprivation of a series of rights of women prisoners through geographical dispersion. Namely, several members of correctional officers stated that the lack of family contact due to the large distance of prison from place of residence can cause serious problems in treatment programs and their resocialization. One prisoner pointed out that the hardest part of her imprisonment was the fact that during her time in prison she did not see her children not even once because they live far away from prison in which she is serving her sentence and their bad financial situation.

Having in mind all the above stated and the fact that building or opening new sections for incarceration of women most likely is financially not manageable, other means of overcoming discrimination and aberration of rights of women prisoners generated by this shortcoming have to be found.<sup>29</sup>

### ACCOMMODATION CONDITIONS IN PRISONS FOR WOMEN

KPZ Tuzla has two spatially separated accommodation capacity. One object is in the center of town (section for women and minors) and the other one (for men) is located at Kozlovac out of the city. Women and minors are separated in different dormitories while they share outdoor space. All women are placed in large dormitories with the capacity from 8 to 12 persons. This type of housing directly affects privacy of women as a basic need. The main accommodation problems are bad toilets. They are placed out of the dormitories and designed for male population. There is lack in amount of showers and toilet bowls as well as sinks. Furthermore the fact that women and minors share space for work and free activities directly affects their possibility to enjoy these rights. Few members of correctional officers stated that due to this fact they are facing great difficulties in their everyday work on resocialization. Namely, according to them, adequately arranged free time is a very important tool in the process of resocialization.

KPZ Kula occupies a large area that includes the area suitable for industrial use. The prison is designed for men, women and minors where each population has physically separated housing. Women are placed in large dormitories with the capacity from 6 to 7 persons. In this prison also, the main accommodation problems are toilets that are not in the accordance with special needs of women.

<sup>26</sup> See: Bartels, L. and Gaffney, A. (2011). *Good practice in women's prisons: A literature review*. Canberra: Australian Institute of Criminology.

<sup>27</sup> See: Quaker United Nations Office. (2008). *Women in prison - A commentary on the UN Standard Minimum Rules for the Treatment of Prisoners*. Geneva - New York: Quaker United Nations Office.

<sup>28</sup> The problems with maintenance of family and social contact as a result of the geographical dispersion of prisons for women can occur from various reasons. Primarily, family members and friends may not be able to frequently, or at all visit imprisoned women because of a lack of transportation from their place of residence to correctional facility (trains, busses, etc.) or because of lack of finance to pay for the transportation (cost of transportation are increased in a cases larger distance) that is not a case with prisons for men in B&H. Secondly, women prisoners cannot use out institutional benefits (going out, weekends, holidays and annual leave) by its full extant due to previously mentioned reasons.

<sup>29</sup> Some of the ways of overcoming of those negative effects can be achieve through financial help, organized visits, transportation and other forms of cooperation with centers for social care.

Both prisons do not have capacity for housing of mothers with children and in cases that imprisoned women has to stay in prison with a child they are placed in regular dormitories that violate their rights and child's wellbeing. In the time of this research in KPZ Tuzla was imprisoned only one mother with a child. She is imprisoned in regular dormitory that she is occupying with her child. According to the statements of prison staff this situation is causing many difficulties and distress for them and especially for imprisoned mother and child. Furthermore, prisons also don't have 'child friendly' rooms adapted for prevention of traumatization of children. From the statements of the prisoners interviewed within the focus groups it is clear that those deficiencies often cause reduction of family visits.

### **SECURITY CLASSIFICATION OF PRISONS (SECTIONS OF PRISONS) FOR WOMEN AND PRISONERS**

Security classifications of prisons as well as a prisoner's security classification determine the parameters of their liberty.<sup>30</sup> Prisons are operated pursuant to rules that determine the degree of supervision and control imposed on prisoners, according to their security classification. Security classifications direct decisions such as the granting of leave from the prison, access to visitors and access to work programs.<sup>31</sup>

In B&H there are only two security classifications of prisons: 'closed' and 'semi closed' type of prisons. In FB&H there is only one prison with security classification 'closed' (KPZ Zenica) while in RS there are two (OZ Foča and OZ Banja Luka). Neither of them has sections for incarceration of women. All women prisoners in B&H are incarcerated in correctional facilities with security classification 'semi closed' that is a lowest existing in a country. At first glance that fact is positive but general deficiency of prisons with a lower security classification (therefore and women's prisons) is an evident form of discrimination.<sup>32</sup> Namely, if take into account type of crime that incarcerated women in B&H have committed it is obvious that most of them should be incarcerated in lower security facility.

Internal classification of prisoners within the prisons in B&H is determined separately for each prison by the Regulation of the internal classification of prisoners and it is not tailored differently for women and men. Even though adequately conducted internal classification should impact every aspect of their prison experience, including their freedom of movement, the frequency and type of contact they have with their children and other family members, and the educational and vocational opportunities available to them, this is not the case in prisons in B&H. Namely, according to the members of correctional officers internal classification is implemented only partially because of lack of basic conditions. Classifications exist only in the form of correctional treatment. All women, regardless of security risk they pose, stay together in same dormitories, recreational and working areas etc. Therefore, almost entire process of internal classification is reduced to limitation of usage of amenities out the institution.

### **SEPARATION OF FEMALE AND MALE PRISONERS**

Regarding the separation of female and male prisoners, UN Standard Minimum Rules for the Treatment of Prisoners<sup>33</sup> in the Article 8 prescribe that all men and women shall as far as

30 European Prison Rules, Rule 18.10 state that: 'Accommodation of all prisoners shall be in conditions with the least restrictive security arrangements compatible with the risk of their escaping or harming themselves or others.' Council of Europe. (2002). *European Prison Rules*. Strasbourg: Council of Europe

31 In many countries there is often limited accommodation for women prisoners compared to male prisoners. Furthermore, the type of available accommodation for women prisoners tends to be limited. For example, in a region where there might be six men's prisons of different security classifications, there may be just one women's prison, or even only one section for women prisoners within the prison for men (that case is in B&H). Where this is the case, that one prison's regime will probably be determined by the maximum security requirement. *This means that women prisoners are particularly likely to be held according to a security classification that is stricter than could be justified by any assessment of the risk that they pose*' Quaker United Nations Office. (2008). *Women in prison - A commentary on the UN Standard Minimum Rules for the Treatment of Prisoners*. Geneva - New York: Quaker United Nations Office

32 The UN Standard Minimum Rules for the Treatment of Prisoners promote the use of open institutions as most favorable to rehabilitation. The use of open institutions is more likely to be appropriate for women prisoners, who are less likely than men to have been convicted of violent acts.

33 United Nations. (1955). *UN Standard Minimum Rules for the Treatment of Prisoners*. Retrieved June 18, 2012, from Office of the High Commissioner for Human Rights: <http://www2.ohchr.org/english/law/treatmentprisoners.htm>

possible be detained in separate institutions or in an institution which receives both men and women the whole of the premises allocated to women shall be entirely separate. However, often as a result of the lack of facilities for women's incarceration, women are often imprisoned in places where men and women share facilities.<sup>34</sup> Despite the fact that officially male and female prisoners are held separately, in practice they are not and this is the case in prisons in B&H.

This represents an important problem because the fact that women prisoners held in a mixed prison (prison with men's and women's sections) often have less access to education and work programs than the male prisoners in the same institution. In both prisons in B&H correctional officers stated that women have fewer possibilities to use exercise equipment and areas set aside for training and work. Most interviewed prisoners stated that they have problems with their free time (lack of content) and that their access to work is limited in comparison to men in same prison. Furthermore, correctional officers in KPZ Tuzla pointed out that they have to find a way of sharing already limited work opportunities between imprisoned women and minors.

### FAMILY AND SOCIAL CONTACT

Adequate connection with the outside world represents vital element of strategies to diminish the harmful effects of imprisonment and assist with social reintegration of all offenders. Strong family ties and support from partners have been identified as key elements of successful social reintegration. Separation from families and children has a particularly negative effect on women. Unfortunately, since women prisoners are often kept at a long distance from their homes, due to the limited number of female prisons, they are likely to receive fewer visits from their families compared to their male counterparts.<sup>35</sup> However, the special needs of women to have access to their families and children are rarely taken into account in regulations relating to prison visits.

The difficulty in maintaining contact causes both the woman and her family to suffer. It aggravates the damage to family ties caused by imprisonment and has a particularly harsh impact on young children. Research shows that lack of adequate contact with children and family members is a key source of anxiety for female prisoners.<sup>36</sup>

Research of this indicator showed that in sections of prisons for women in B&H there are no policies regarding those issues and that provisions of ZIKS (that is not gender sensitive) are in use. Correctional officers stated that no social or any other type of help, in context of maintaining family contacts, is provided for socially vulnerable categories of women who are domiciled far from prison.

Further problem present conditions during prison visits. Conditions in which visits are conducted are of great importance to maintaining social links and for preserving prisoners' self-respect.<sup>37</sup> As previously discussed both prisons for women in B&H have equal conditions for visits of man and women prisoner. Namely, in both prisons there are no special and children friendly adapted areas for visit. Interviewed prisoners stated that current environment for a visit is hostile in terms of the physical surroundings as well as staff attitudes. Prison personnel pointed out that they have never received any type of education or training for stress reduces for children when visiting. The entire situation is aggravated with the fact that children are being submitted to body search when visiting (according to 'Basic training manual for prison staff no. 1 of Council of Europe'). Although children and their possessions should be searched with sensitivity that requires special training of the prison personnel, during this research we established that there are not any types of programs and education of staff involved in visits of children, which will make them aware of their vulnerability.

### HYGIENE, HEALTHCARE AND HIV/AIDS

Studies confirm that female prisoners often have more health problems than male prisoners.<sup>38</sup> As indicated before, many have chronic and complex health conditions resulting from lives of

<sup>34</sup> See: Quaker United Nations Office. (2008). *Women in prison - A commentary on the UN Standard Minimum Rules for the Treatment of Prisoners*. Geneva - New York: Quaker United Nations Office.

<sup>35</sup> See: Daniels, R. V. (1996). 4 C.N.L.R. 51. In L. Arbour, *Commission of Inquiry into certain events at the Prison for Women in Kingston* (p. 216). Public Works and Government Services Canada.

<sup>36</sup> Harrison. (2000). In E. Stanley, & S. Byrne, *Mothers in Prison: Coping with Separation from Children, paper presented at the Women in Corrections: Staff and Clients Conference* (p. 3). Adelaide

<sup>37</sup> UN Office on Drugs and Crime. (2008). *Handbook for prison managers and policymakers on Women and Imprisonment*. UN Office on Drugs and Crime, p 62.

<sup>38</sup> UN Office on Drugs and Crime and World Health Organization. (2009). *Women's health in prison. Correcting gender inequity in prison health*. Copenhagen: WHO Regional Office for Europe, p 23.

poverty, drug use, family violence, sexual assault etc. Therefore, female prisoners often have greater primary healthcare needs in comparison to men.<sup>39</sup> Therefore, gender-specific health care framework with special attention to reproductive health, mental illness, substance use problems and physical and sexual abuse must be developed in women's prisons.<sup>40</sup>

Unfortunately, in prisons in B&H particular health care needs of women (such as regular showers, availability and proper disposal of personal care products due to menstruation, adequate nutrition for pregnant women and for women with diseases) are almost completely disregarded and existing programs deal with this concerns only superficially. Every woman has right to certain amount of hygiene products regardless of their individual needs (this is especially problem with sanitary napkins).<sup>41</sup> This is a problem that most women in focus group indicated. Combining this fact with a fact that, according to their statements, most women do not receive help in form of hygiene supplies from outside of prison indicate very discriminatory position. Imprisoned women must have adequate and culturally appropriate sanitary and washing facilities especially if pregnant or nursing. Even though women must have a way to safely dispose of bloodstained articles, and they should be able to obtain new underwear as required, most of them stated that it is not a case. Taking into account determined state on those issues in both prisons we can conclude that treatment of women prisoners is discriminatory and degrading.

The problem is deepened with the lack of special healthcare programs concerning menstruation, menopause and women's sexual health. All interviewed members of prison staff stated that those questions are not discussed more than it is necessary to take care of certain problems that appear on this meter. Furthermore, they stated that prison staff never had any form of education and training about menopause and often they are not aware of the intense stress that menopause may place upon a woman in prison.

## GENDER SENSITIVE EDUCATION AND TRAINING PROGRAMS

To ensure equity and equality of women prisoners in its true sense it is vital to have educated and sensitized prison personnel on all levels. The important finding of our research, that has to be stress out, is a complete lack of gender sensitive education and training programs for prison staff. Namely, though the series of variety of prison employees (correctional officers, guards, management, sanitary services workers, etc.) we tried to determine the existence of specific trainings and educations for prison employees on gender issues and we found out that no member of prison staff received any form of training or education on any type of gender issues (specific needs of women, healthcare, victimization, etc.). Basically, prison staff is shifted from section for women to section for man and even into section for minors on regular bases and they perform their duties on a same way wherever they are assigned to work.

## CONCLUSIONS AND RECOMMENDATIONS

By examining fifteen variables and great number of their indicators, of which only few is presented in this paper, we came to conclusion that two sections (departments) for the imprisonment of women in both entities in B&H are strictly designed for prevalent male population of prisoners. Namely, from questions of accommodation, livability, healthcare, hygiene, etc. it is evident that women in B&H serve their sentences in circumstances that are according to almost all criteria discriminatory.

Housing of man and woman is equal, treatment programs are the same, classification (internal as well as external) criteria and risk assessment tools do not take into account specific needs of women (they are equal to those used for man). Family and social contact is deprived due to the numerous factors, gender sensitive education and trainings for women prisoners do not exist, strip searches are routine, healthcare and conditions for maintenance of personal hygiene are same as in parts of prison for man. In almost all aspects of prison life, the fact that women have different needs due to their biological determination is neglected. Based on conducted research

39 WHO Regional Office for Europe (2007). Health in prisons: a WHO guide to the essentials in prison health. Copenhagen: WHO Regional Office for Europe.

40 UN Office on Drugs and Crime and World Health Organization. (2009). *Women's health in prison. Correcting gender inequity in prison health*. Copenhagen: WHO Regional Office for Europe, p 20.

41 See: WHO Regional Office for Europe (2007). Health in prisons: a WHO guide to the essentials in prison health. Copenhagen: WHO Regional Office for Europe.

we can conclude that in B&H prison system correctional procedures are gender neutral and that they have disadvantaged women in a variety of ways.

Bearing in mind that establishment of new prisons for women is extremely costly and thus unattainable in near future, as a first step in improvement of state of incarcerated women in B&H we propose a creation of handbook on women and imprisonment in B&H that can be used by stakeholders, prison managers and prison personnel of all levels, as well as by policymakers. In long term, application of this handbook will lead to the creation of a common and unified gender sensitive correctional procedure in all prisons in B&H and ultimately contribute to a higher level of equity and equality of woman in a true sense.

The main focus of the handbook would be on the woman prisoners and on elaborate guidance on the components of a gender sensitive approach to prison management, taking into account the typical background of female prisoners and their special needs. Therefore it should be used in conjunction with general prison management manuals and relevant international instruments covering the treatment of all prisoners. Through this handbook further issues should be brought to attention and resolved: ensure that prison management and prison personnel is gender sensitive; provide entire prison personnel with special training on the needs of women prisoners; house all women prisoners in accommodation that is physically separated from accommodation that men occupies; In all occasions ensure that women prisoners are supervised by female prison staff; consider eliminating body search of visitors, especially children by using alternative means of screening; consider body searches of prisoners as exception rather than routine; ensure that male personnel are never involved in body search and that they are not in a places where they can watch body search while conducted by female staff; introduce specific programs that address underlying factors that lead to criminal offences in women; introduce a gender specific framework for healthcare in sections for women in prisons; ensure that specific hygiene needs of women are properly met (especially for women who are pregnant, breastfeeding and menstruating); improvement in family and social contact take measures to compensate difficulties in undertaking family visits; provide children friendly environment for visit; train prison personnel to be sensitize for those type of visits; ensure prison activities and programs that take into consideration specific needs of women; and develop cooperation with NGO sector.

Therefore, creation of that handbook should give necessary assistance to legislators, policymakers, prison managers, staff and nongovernmental organizations in process of implementation of the resolutions and recommendations of the United Nations in order to efficiently address the gender-specific needs of women prisoners.

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## HEALTH CARE OF PRISONERS AS A CRIME PREVENTION FACTOR – GENERAL STANDARDS AND CONDITIONS IN SERBIA

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**Abstract:** Appropriate health care and adequate medical treatment of prisoners with health issues and intensive rehabilitation of drug and alcohol addicts during the execution of prison sentence may be considered one of the factors that contribute to their successful re-socialization. Social reintegration of former prisoners, particularly through their reintroduction to the labor market is perceived as a powerful means to reduce recidivism and, hence, protect the society from crime. However, that goal cannot be achieved if their physical or mental health is harmed. Managing to preserve physical and mental health in spite of being exposed to numerous prison deprivations, represents a precondition for re-entering regular life courses in post release period, such as: initiating or proceeding education or professional training, entering or returning to the labor market, finding and keeping a job as a legal source of income and becoming a useful member of the community. Apart from being one of fundamental human rights, the fact that it represents a precondition for successful social reintegration is also the reason why prisoners' health and minimal standards regarding their medical care are prescribed by various legal documents of national and international character and monitored by competent entities including independent bodies such as ombudsperson and non-governmental organizations. Being aware of the importance of the implementation of national and international prisoner's health care standards for both – human rights protection and crime prevention, the authors briefly analyze legal documents regulating this issue and critically examine current conditions in Serbian prisons pertinent to the fulfillment of minimal health care requirements, treatments available for prisoners with HIV or hepatitis and rehabilitation programs for drug and alcohol abusers and, finally, give suggestions for the improvement of the existing situation.

**Keywords:** prisons, prisoners, health care, medical treatment, crime prevention

### INTRODUCTORY REMARKS

The term “health protection“ i.e. “right of health protection” is defined as the right of a person to require other persons to conduct certain activities within their authority in order to conserve and improve his or her health.<sup>1</sup> Health is the condition of human organism in which all organs function regularly without the feeling of pain. It does not refer only to the absence of disease or disability, but includes complete physical, mental and social welfare.<sup>2</sup> The right of health protection may be perceived from two perspectives: as the right of access to certain health services and as state's obligation to undertake appropriate measures in order to provide equal approach to health protection for all the citizens.<sup>3</sup> The importance of health protection of all citizens is indisputable in modern democratic societies, but that issue appears to be even more serious in the case of persons deprived of liberty. The execution of prison sentence is inevitably followed by a series of deprivations, the most frequent of which are: deprivation of liberty, deprivation of material goods and services, deprivation of heterosexual relationships, deprivation of autonomy and deprivation of safety<sup>4</sup>.

1 Radišić, J. (2008). *Medicinsko pravo*. Beograd: Pravni fakultet Univerziteta Union, Nomos, 55-57.

2 Article 2, Constitution of the World Health Organization (Off. Rec. Wld Hlth Org., 2, 100), <http://apps.who.int/gb/bd/PDF/bd47/EN/constitution-en.pdf>, 16.12.2013

3 Paunović, M., Krivokapić, B., Krstić, I. (2007). *Osnovi međunarodnih ljudskih prava*. Beograd: Megatrend Univerzitet, 274.

4 Konstantinović Vilić, S., Kostić, M. (2006). *Penologija*. Niš: Sven, 221.

Isolation from the outer world and continuous dwelling in a „total” institution produces numerous consequences affecting physical and mental health of inmates. The aim of prison sentence (within general purpose of criminal sanctions)<sup>5</sup> is to encourage the offender to embrace socially acceptable values and contribute to his social reintegration through various programs and treatments<sup>6</sup>. In that sense, it can be argued whether a person whose physical and/or mental health are seriously harmed or deteriorated during the enforcement of prison sentence can be expected to become a useful member of the community. From that standpoint, it seems obvious that adequate health care of prisoners, particularly those who suffer from serious mental or physical illnesses, can be considered one of the means of crime prevention.

In contemporary legal systems, health protection of all citizens, including those deprived of liberty on the basis of a final court decisions, is considered one of fundamental human rights proclaimed on national and international level. Accordingly, standards for health care of prisoners can be found in two groups of legal sources. The first includes the documents regulating general standards of health protection, whereas the second is comprised of documents setting minimal standards for the execution of prison sentence and respect of prisoners’ human rights. In 1946, the Constitution of World Health Organization, declared Health as one of fundamental and inalienable rights of every person, regardless of racial, religious, political, economic and social differences.<sup>7</sup> Right of health, defined as the right of every person to live under circumstances and standards that provide health and welfare of every individual and his family is also proclaimed in the Universal Declaration of Human Rights.<sup>8</sup> International Covenant on Economic, Social and Cultural Rights also recognizes the right of everyone to the enjoyment of the highest attainable standard of physical and mental health and it recommends the steps that should be taken by the States Parties in order to achieve the full realization of this right.<sup>9</sup> The Revised European Social Charter, *inter alia*, calls upon its signatories to provide the conditions in which everyone has the right to benefit from any measures enabling him to enjoy the highest possible standard of health attainable.<sup>10</sup> These documents treat the right of health as a moral principle or a political postulate according to which all citizens have access to health care under equal conditions and without discrimination.<sup>11</sup>

Modern legal systems recognize that the execution of prison sentence in the manner that increases the suffering caused by the deprivation of liberty can neither improve the efficiency of punishment nor fulfill its essential purpose – special and general prevention<sup>12</sup>. It is widely accepted that the humanization of the conditions under which prison sentence is served represents a global standard embodied in a series of international documents – guarantees of prisoners’ fundamental human rights, the most relevant of which are: Standard Minimum Rules for the Treatment of Prisoners<sup>13</sup>, Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment<sup>14</sup>, European Convention for the Prevention of Torture

5 Paragraph 4, Subparagraph 2, Criminal Code of the Republic of Serbia, Official Gazette of the Republic of Serbia, No. 85/2005, 88/2005, 107/2005, 72/2009 and 111/2009

6 Paragraph 31, Law on the Enforcement of Criminal Sanctions, Official Gazette of the Republic of Serbia, No. 85/2005, 72/2009 and 31/2011

7 Constitution of the World Health Organization (*Off. Rec. Wld Hlth Org.*, 2, 100), <http://apps.who.int/gb/bd/PDF/bd47/EN/constitution-en.pdf>, 16.12.2013.

8 Article 25. *The Universal Declaration of Human Rights, General Assembly Resolution 217 A (III)*, <http://www.ohchr.org/en/udhr/pages/introduction.aspx>, 14.09.2013.

9 Article 12. International Covenant on Economic, Social and Cultural Rights Adopted and opened for signature, ratification and accession by General Assembly resolution 2200A (XXI) of 16 December 1966, entry into force 3 January 1976, in accordance with article 27, <http://www.ohchr.org/Documents/ProfessionalInterest/cescr.pdf>, 16.12.2013.

10 Article 11. Revised European Social Charter, Council of Europe, Strasbourg, 3.5.1996, European Treaty Series, No. 163., <http://conventions.coe.int/Treaty/Commun/QueVoulezVous.asp?NT=163&CM=8&CL=ENG>, 16.12.2013.

11 Radišić, J. (2008). *op.cit.*, 58.

12 Soković, S. (2002). Zaštita i ograničavanje prava osuđenih lica. *Pravni život – časopis za pravnu teoriju i praksu*, 51 (9), 530.

13 Standard Minimum Rules for the Treatment of Prisoners, The Economic and Social Council resolutions 663 C (XXIV) of 31.06.1957. and 2076 (LXII) of 13.05.1977., <http://www.ohchr.org/EN/ProfessionalInterest/Pages/TreatmentOfPrisoners.aspx> 16.12.2013.

14 Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment, adopted and opened for signature, ratification and accession by General Assembly resolution 39/46 of 10 December 1984, entry into force 26 June 1987, in accordance with article 27 (1), <http://www.ohchr.org/EN/ProfessionalInterest/Pages/CAT.aspx>, 16.12.2013.

and Inhuman or Degrading Treatment or Punishment<sup>15</sup>, European Prison Rules<sup>16</sup> and General Reports of the European Committee for the Prevention of Torture and other inhumane or degrading punishments or procedures<sup>17</sup>. Finally, the European Convention for the Protection of Human Rights and Fundamental Freedoms<sup>18</sup> contains the ban of torture and other inhumane or degrading procedures or punishments<sup>19</sup>. The ratification of this international document by the Republic of Serbia led to a significant procedural improvement in our country's rather developed normative framework dedicated to the protection of prisoners' human rights by allowing them to send individual applications to European Court of Human Rights.<sup>20</sup>

### NORMATIVE FRAMEWORK FOR PRISONER'S HEALTH PROTECTION IN SERBIA

Normative framework relevant to the protection of prisoners' human rights in Serbia, including the right of health protection includes: the Constitution, Law on the Enforcement of Criminal Sanctions and Regulation on House Order in Penitentiary Institutions. The Constitution of the Republic of Serbia proclaims that every citizen has got the right of protection of his physical and mental health.<sup>21</sup> Constitutional provisions protecting citizens' physical and mental integrity are also worth mentioning, as well as those prescribing that no citizen may be exposed to torture, inhumane or degrading treatment or punishment or subject to medical or scientific experiments without his agreement.<sup>22</sup> Constitutional provisions that prohibit any kind of violence against persons deprived of liberty and oblige relevant state bodies to treat these persons in a humane way and with full respect for their personal dignity are also important for the protection of prisoners' physical and mental health.<sup>23</sup>

Law on Health Protection defines health protection as an organized and comprehensive activity of the society, the goal of which is to achieve the highest possible level of conservation of individual and family health. It comprises the enforcement of measures necessary for the maintenance and improvement of citizens' health, prevention suppression and diagnosis in the early stage of diseases, injuries, and other health disorders as well as prompt and efficient treatment and rehabilitation.<sup>24</sup> The right of health protection is recognized to all citizens of the Republic of Serbia, and to persons with permanent or temporary residence on its territory.<sup>25</sup> The accessibility of health protection should be perceived in the context of following principles: accessibility, righteousness, comprehensiveness, continuity, efficiency and constant improvement of health care quality.<sup>26</sup> The Law also prescribes that all patients have equal access to health protection without any discrimination based upon financial position, place of residence, type of disease

15 European Convention for the Prevention of Torture and Inhuman or Degrading Treatment or Punishment, Strasbourg, 26.XI.1987, European Treaty Series, No. 126, text amended according to the provisions of Protocols No. 1 (ETS No. 151) and No. 2 (ETS No. 152) which entered into force on 1 March 2002, <http://www.cpt.coe.int/en/documents/ecpt.htm>, 16.12.2013.

16 Recommendation Rec (2006) 2 of the Committee of Ministers to member states on the European Prison Rules, adopted by the Committee of Ministers on 11 January 2006 at the 952nd meeting of the Ministers' Deputies, <https://wcd.coe.int/ViewDoc.jsp?id=955747>, 16.12.2013.

17 Particularly significant are The Second General Report /CPT/Inf (92) 3/, The Seventh General Report /CPT/Inf (97) 10/, The Ninth General Report /CPT/Inf (99) 12/ and the Twelfth General Report /CPT/Inf (2002) 15/, <http://www.cpt.coe.int/en/docsannual.htm>, 16.12.2013.

18 Convention for the Protection of Human Rights and Fundamental Freedoms as amended by Protocols No. 11 and No. 14, Rome, 4.XI.1950, <http://conventions.coe.int/Treaty/en/Treaties/Html/005.htm>, 16.12.2013.

19 Konstantinović Vilić, S., Kostić, M. (2005). Evropski standardi za izvršenje krivičnih sankcija, *Pravni život – časopis za pravnu teoriju i praksu*, 54 (9), 888 – 889.

20 Soković, S. (2005). Izvršenje kazne zatvora – relevantni međunarodni pravni standardi. *Pravni život – časopis za pravnu teoriju i praksu*, 54 (9), 714.

21 Paragraph 68, Subparagraph 1, Constitution of the Republic of Serbia, Official Gazette of the Republic of Serbia, No. 98/2006

22 Paragraph 25

23 Paragraph 28

24 Paragraph 2, Law on Health Protection, Official Gazette of the Republic of Serbia, No. 107/2005, 72/2009, 88/2010, 99/2010, 57/2011, 119/2012 and 45/2013

25 Paragraph 3

26 Paragraphs 19 – 24



or time of access to health service.<sup>27</sup> Specific populations of citizens that are considered more prone to the risk of disease for various reasons are enumerated the Law.<sup>28</sup> Although there are circumstances suggesting that prisoners could be recognized as a particularly vulnerable group prone to the risk of deterioration of physical and mental health, the Law fails to do so. Instead, their rights and obligations in health protection are regulated by the Law on the Enforcement of Criminal Sanctions<sup>29</sup> and Regulation on House Order in Penitentiary Institutions and District Prisons<sup>30</sup>.

The most important guarantees of prisoners' human rights in the Republic of Serbia, including health protection, are systematized within a separate chapter of Law of the Enforcement of Criminal Sanctions – Chapter Six entitled as „The Position of The Convict“<sup>31</sup>. The Law guarantees this right to all prisoners, in accordance with general legal provisions regulating health protection. If appropriate health protection and medical care cannot be provided within the penitentiary institution the patient must be transferred to the Special Prison Hospital or other suitable institution, whereas a pregnant female prisoner must be transferred to maternity hospital.<sup>32</sup> Health Protection Service represents one of the services that may be established within every penitentiary institution.<sup>33</sup> It is in charge of health prevention, treatment of ill prisoners and detainees and supervises hygiene and food and water quality and participates in the creation and implementation of in-prison treatment programs. The Service must include at least one general medical practitioner and one medical technician and provide the services of one psychiatrist. Hospital treatment can also be organized within the prison facility. In that case, medical practitioners and technicians with adequate level of expert knowledge, proper hospital premises and necessary medical supplies, devices, tools and medicaments need to be available<sup>34</sup> and the Prison Manager has to take into consideration the suggestions of medical practitioner when deciding upon some issues pertinent to the organization of everyday life and activities of the prisoners.<sup>35</sup> Separate premises for ill prisoners must be provided in every penitentiary institution.<sup>36</sup>

Medical practitioners employed in penitentiary institutions are obliged to: 1) conduct medical examination of all prisoners upon their arrival to prison, after their return from temporary leave and prior to their final release; 2) assess whether a prisoner is physically or mentally ill and determine his working ability whenever it is necessary; 3) promptly conduct medical examination of any prisoner with reported or indicated health problems; 4) on a daily basis conduct medical examinations of prisoners who are ill, who refuse food or water and regularly, at least once in three months, conduct medical examinations of other prisoners; 5) control the accommodation, nutrition, hygiene, sanitary and other conditions relevant to prisoners' health; 6) keep separate records on prisoners' injuries and inform the Prison Manager about any sign or indication that the prisoners are treated in a violent manner and 7) supervise the functioning of prison pharmacy and the work of staff in charge of keeping records, issuing and delivering appropriate therapy. Apart from the aforementioned, the duties and obligations of medical technician pertinent to written reports, expert findings and recommendations that he delivers to the Prison Manager are also significant. These include: 1) delivering periodical reports on prisoners' health condition, 2) reporting any case of harm or deterioration of prisoner's physical or mental health that are the result of prolonged dwelling in prison or of the manner in which the penalty is executed and recommending measures that should be applied in such cases, including interrupting the execution; 3) gives recommendations on the quantity and quality of prisoners' meals; 4) recommends measures to improve the hygiene, sanitary conditions, heating, light and air-circulation in prison premises and 5) delivers findings and recommendations regarding

27 Paragraph 26 Subparagraph 2

28 Paragraph 11, Subparagraph 2, Points 1 -13

29 Law on the Enforcement of Criminal Sanctions

30 Regulation on House Order in Penitentiary Institutions and District Prisons, No. 110-00-6/2010-03 adopted on 27.09.2010, Official Gazette of the Republic of Serbia 72/2010

31 Law on the Enforcement of Criminal Sanctions

32 Paragraph 101

33 Paragraph 18, Subparagraph 1, Point 4

34 Paragraph 23

35 Paragraph 27 Subparagraph 6, Regulation on House Order in Penitentiary Institutions and District Prisons

36 Paragraph 18, Subparagraph 4

necessary physical activities of the prisoners. Prison Manager is obliged to implement all these recommendations without delay.<sup>37</sup>

A set of more detailed provisions on prisoners' health protection is found in the Regulation on House Order in Penitentiary Institutions and District Prisons<sup>38</sup>. The Regulation treats right of health protection as one of prisoners' fundamental human rights and obliges the prison administration to provide accommodation in compliance with contemporary medical and health criteria<sup>39</sup>. Penitentiary institutions are required to provide necessary preconditions for health protection in accordance with the law, including special premises for medical examinations of prisoners and special room for ill prisoners that must be spacious, clean, with natural and artificial light sources, well heated and equipped with appropriate sanitary devices with hot and cold water.<sup>40</sup> The regulation also prescribes the duties of prisoners pertinent to their health protection, obliging them to undertake measures necessary for protection and maintenance of health and hygiene as well as to obey the instructions of medical practitioners on medical treatment and prevention of contagious diseases.<sup>41</sup>

Medical examination of prisoners must be conducted upon their arrival to the institution, or at least within the period of 24 hours after, or without delay upon prisoner's request or if some health troubles have been noted during his reception. Prisoner's personality and personal dignity must be respected during medical examinations and the application of hygiene measures.<sup>42</sup> A prisoner may demand medical examination, without giving any further explanations on the reasons for his request and security staff members have to make special written notes on that. In emergency cases, every prison staff member has to demand urgent medical help to be provided for the prisoner.<sup>43</sup> Medical examination should be conducted only in the presence of medical practitioners and technicians (unless they require the presence of other prison staff members), individually and in the manner which guarantees the respect of prisoner's personality and dignity. Upon prisoner's request, the Prison Manager may allow him to be examined by a special medical technician even if such examination has not been approved by general medical practitioner. In such cases, the prisoner has to cover the expenses of medical examination, unless the Prison Manager decides something else. Medical treatment of prisoners cannot be conducted without their consent. But, if the prisoner seriously endangers his own life or health by refusing to undergo medical therapy, medical measures prescribed by medical practitioner can be applied even without his agreement. Since prisoners' hunger strikes occasionally occur in Serbian prisons<sup>44</sup>, provisions prohibiting coerced feeding are also very important. However if a prisoner seriously endangers his own life or health, measures prescribed by medical practitioner shall be applied.<sup>45</sup>

## CURRENT CONDITIONS OF PRISONERS' HEALTH CARE IN SERBIA

The analysis of current legislative acts shows that the Republic of Serbia has got a satisfactory normative framework which provides prisoners with a series of rights and possibilities pertinent to the accomplishment of their health protection in accordance with European and Universal human rights and health care standards. However, a more thorough analysis of reports issued by the Administration for the Enforcement of Criminal Sanctions, the Ombudsperson<sup>46</sup> and some non-governmental organizations and international entities suggests that the reality is far from satisfactory. These statements refer particularly to the fulfillment of European standards in the field of treating prisoners with HIV/AIDS, prisoners who suffer from mental disorders and substance-abusers.

37 Paragraph 103, Law on the Enforcement of Criminal Sanctions,

38 Paragraph 27 Subparagraph 6, Regulation on House Order in Penitentiary Institutions and District Prisons

39 Paragraphs 14 and 15

40 Paragraph 27

41 Paragraph 31

42 Paragraph 11

43 Paragraph 35

44 See for example: Official Announcement "Extraordinary Control of the Ombudsperson Deputee in Niš Penitentiary Institution", 06.10.2009., <http://www.ombudsman.rs/index.php/langsr/aktivnosti/saopstenja/617-2009-10-06-08-27-36>, 17.12.2013.

45 Paragraph 102, Law on the Enforcement of Criminal Sanctions and Paragraphs 28 and 29, Regulation on House Order in Penitentiary Institutions and District Prisons, 14.

46 Batričević, A. (2011). Zaštitnik građana i poštovanje prava zatvorenika u Republici Srbiji, *Branič*, 124 (1-2), 135-156

Health protection of persons deprived of liberty is conducted through Health Services of the Administration for the Enforcement of Criminal Sanctions, Special Prison Hospital and, when necessary, ambulances and hospitals within the Ministry of Health. Significant improvements were made when the Agreement between the Ministry of Health and the Ministry of Justice prescribing that the expenses of medical treatments of persons deprived of liberty are to be covered by the Ministry of Health was signed, because it enabled the avoidance of unnecessary and complicated administrative procedures. This agreement also allowed detainees and prisoners to gain access even to the most complex diagnostic procedures, therapies, and surgery interventions under the same conditions that are required for other citizens.<sup>47</sup> The cooperation between the two Ministries included: active screenings for tuberculosis, voluntary and confidential advising and testing on HIV/AIDS, substance abuse prevention programs and educational programs on spreading blood-transmittable diseases and mammographic examinations. In addition, all penitentiary institutions were provided with substitutive methadone therapy of drug-addicts.<sup>48</sup>

At the moment, the most important issue, detected not only in Serbian prisons but on global level as well, seems to be a great amount of substance abusers among the prison population and a large number of inmates infected with HIV/AIDS or Hepatitis B or C. Within the cooperation between the Ministry of Justice, Global Fund, UNDOC and Serbian prisons, a strategy for combating psychoactive substance addiction and “damage control” programs are implemented, including substitutive methadone therapy and functioning of “drug-free department” in the Special Prison Hospital. Although the establishment of drug free departments was planned in other large penitentiary institutions in our country, financial obstacles and lack of professional staff delayed the accomplishment of that intention.<sup>49</sup>

Although the exact number of HIV infected prisoners cannot be estimated with certainty, it is considered that their percentage is much larger than among the general population. The percentage of HIV infected persons in Ukraine is 10 times larger in the prison population than among other citizens, one third of HIV infected persons in Central Asia are prisoners, whereas in South Africa nearly one half of prison population is HIV positive.<sup>50</sup> The accurate number of HIV infected prisoners in Serbia cannot be precisely determined since the only available data on this issue are the ones published in the Reports of the Administration for the Enforcement of Criminal Sanctions. It is suspected that the number of HIV infected prisoners is much larger than the one presented in the reports, due to the fact that some of them have not yet shown the symptoms of this disease or been officially registered. Similar can be said about the number of drug addicts, because psychoactive substances’ testing is not obligatory at the moment of arrival to the institution and there are no formal records on drug or alcohol abusers. The presence of virus Hepatitis B and C is also frequent. The number of prisoners infected with HIV and Hepatitis B and C between 2005 and 2012 is presented in Table 1. These are officially registered cases, but, the actual dimensions of the problem could be perceived only if the unregistered ones were added.

Godina	Broj osuđenika zaraženih HIV virusom	Broj osuđenika zaraženih virusom hepatitisa B i C
2005	22	528
2007	27	1784
2008	47	1548
2009	70	2189
2011	60	3331
2012	20	1671

*Table 1. The number of prisoners infected with HIV and Hepatitis B and C per year (2005-2012)*

47 Joka, D. (Ed.) (2012). *The 2011 Annual Report on the Work of Administration for the Execution of Criminal Sanctions*, Belgrade: Ministry of Justice of the Republic of Serbia – Administration for the Execution of Criminal Sanctions.

48 Draft Strategy of the Development of the System of Execution of Criminal Sentences in the Republic of Serbia in the period between 2013 and 2020, <http://www.mpravde.gov.rs/obavestenje/1561/radna-verzija-strategije-razvoja-sistema-izvršenja-krivinih-sankcija-2013-2020.php>, 18.12.2013.

49 Joka, D. (Ed.) (2012). *op.cit.*, 14.

50 See: *Health in prisons: Realising the Right to health*, <http://www.penalreform.org>, 19.12.2013.

One of the greatest problems affecting HIV infected prisoners is the lack of access to other institutions, organizations and programs providing assistance and support related to HIV treatment, and prevention. It is necessary to improve their knowledge about the possibilities of treatment and give them information on relevant organizations, associations of persons living with HIV and other institutions and individuals providing services and help for HIV infected persons.<sup>51</sup> One scientific research on the frequency of risk and protective behavioral patterns and the level of sensitivity to HIV and other sexually transmittable diseases among persons serving prison sentence Serbia has confirmed the existence of urgent need to create specific HIV prevention programs designed in accordance with the needs to the prison population. The results of this research show that 1 out of 7 prisoners has experienced intravenous drug intake. Furthermore, 5% of imprisoned intravenous drug abusers admitted that they consumed drug for the first time in prison, whereas 39.5% said that they shared the needle with their inmates at least once. Moreover, 1 out of 5 prisoners had their tattoos made in prison, and 14.7% admitted that they did not use sterilized equipment on that occasion. While serving prison sentence, 16.3% of prisoners had sexual intercourses with irregular sexual partners and slightly more than 20% of prison population is familiar with basic facts on HIV/AIDS. On the other hand, 83.9% of prisoners expressed discriminatory attitude against persons infected with HIV.<sup>52</sup> Mental health issues of HIV infected prisoners differ from the ones that the rest of the prison population is facing with, due to the complexity of their living situation, their criminal background, frequently dysfunctional families and lack of means to control their problem due to the isolation and specific prison environment. Researchers and medical experts who studied the issue of health care of HIV infected prisoners tend to emphasize that prisoner-s awareness of his own HIV positive status and living with HIV in prison should be perceived in the context of other problems commonly affecting this population, including their social, psychological and medical aspects.<sup>53</sup>

The 2012 Annual Report on the Work of the Administration for the Enforcement of Criminal Sanctions highlights that prisoners infected with HIV and Hepatitis C can receive adequate therapy at special hospitals for infectious disease within the Ministry of Health under the same conditions as other citizens. In 2011, the Council of Europe evaluated this approach to resolving the issue of prisoners' medical treatment as "an example of good practice". Nevertheless, it is rather concerning that only 23 prisoners were vaccinated against Hepatitis B in 2012 and that only 8 HIV positive prisoners are currently receiving adequate therapy. Even if we assume that the number of HIV infected prisoners in our prisons is minor in comparison to other countries, this problem must not be ignored or neglected because the lack of appropriate and prompt reaction may produce a series of negative repercussions, primarily due to a constant increase in the number of infected persons.<sup>54</sup> Specific problems related to the presence of HIV in prisons are multi-dimensional and should be observed from at least three aspects: the procedure the prisoner is subject to upon his arrival to the institution and testing that should be conducted therein, the adequacy of current accommodation scheme of infected persons and the organization of their everyday activities, with focus on disease-prevention programs.<sup>55</sup>

When it comes to prisoners' mental health, the Report of the European Committee for the Prevention of Torture and Inhumane or Degrading Treatment or Punishing particularly pointed out that the quality of psychiatric treatments and psychological services delivered in Serbian prisons is rather weak. The Report suggests that a greater amount of attention should be dedicated to psychological, social and educative support for substance-abusers. Namely the treatment of drug addicts in our prisons is comprised solely of the so called methadone therapy, which is provided only for those prisoners who are officially registered as drug abusers upon their arrival to the institution. Therefore, it is highlighted that the treatment of prisoners with psychoactive substance abuse problems should include a combination of preventive policies and programs including medical detoxification, psychological support, rehabilitation and substitution.<sup>56</sup>

51 Ilijić, L.J. (2011) Deprivacija sigurnosti i HIV virus kao faktori koja narušavaju sigurnost osuđenika, *Zbornik Instituta za kriminološka i sociološka istraživanja*, 29 (1-2), 109-118.

52 Krstić, M., Terzić, Z., Knežević, T., Ivanović, I., Bjelić, I. (2008) Rizični oblici ponašanja i faktori rizika na HIV među zatvoreniciima u Republici Srbiji, *Glasnik Zavoda za zaštitu zdravlja Srbije*, 80 (3), 19-22.

53 Stojanovski, J., Stojanović, M., Petrović, B. (2007) *Mentalno zdravlje i HIV/AIDS u Srbiji, Kvalitativna studija o problemima mentalnog zdravlja osoba koje žive sa HIV-om*, GIP Ekspertski centar za mentalno zdravlje i HIV/AIDS u Srbiji. <http://www.ian.org.rs/sida/publikacije/mentalno%20zdravlje%20i%20HIVAIDS.pdf>, 21.12.2013.

54 Joka, D. (Ed.) (2012). *op.cit.*, 15.

55 Pavlović, M. (2008) Specifični problemi zatvorske populacije zaražene HIV virusom, *Pravni život, Časopis za pravnu teoriju i praksu*, 57(9), 833-843.

56 Izveštaj Vladi Republike Srbije o poseti Evropskog komiteta za sprečavanje mučenja i neljudskog ili ponižavajućeg postupanja ili kažnjavanja (CPT), 1-11.2. 2011., <http://www.cpt.coe.int/documents/srb/2012-17-int-srb.pdf>, 21.12.2013.

## CONCLUSION

Health care of persons deprived of liberty is a multi-layered issue, significant from several different aspects. First of all, prisoner's right of adequate health protection is one of their fundamental human rights, implementation of which is directly linked to the principle of humane treatment during the execution of prison sentence<sup>57</sup>. Contemporary concept of custodial sentences is based upon the standpoint that the limitation of liberty combined with prison life conditions already represents a severe punishment, excluding any need for further deprivations. Right of health protection is guaranteed by several international documents that are applied on all citizens without discrimination, but health care and medical treatment of prisoners are also regulated in special international documents dedicated to the protection of their human rights. The fact that around 30 million people per year enter and leave prisons worldwide is a strong argument to treat the issue of health care within penitentiary institutions as an aspect of public health and, give it the attention it deserves.

Since the major purpose of modern criminal sanctions includes re-socialization and social reintegration, the focus of the entire concept of prison sentence is now on the preparation of inmates to become useful and law-abiding community members. One of the preconditions for the accomplishment of that intention is to enable them to find legal and regular sources of income and re-enter the labor market, which cannot be achieved without the respect of their human rights<sup>58</sup>, including appropriate maintenance or even improvement of their physical and mental health. It is scientifically approved that physical and mental suffering causes passivity, resistance and loss of critical attitude on one's own behavior, which means that prison conditions that cause such consequences are in collision with the proclaimed purpose of punishment and even suitable to generate recidivism instead of preventing it.<sup>59</sup> In that context, adequate living conditions in prisons and providing adequate health protection and medical care of prisoners that would assure preservation and amelioration of their physical and mental well-being should be perceived not only as the embodiment of the principle of humanity but also as a means of crime prevention. So, not only does appropriate health care of prisoners represent a way to protect their individual human rights and interests, but it also has a broader purpose – to enhance the re-socialization of prisoners, increase their chances to reintegrate in the community as its active, responsible and useful members and, as the final result protect the society from crime.

Adequate system of health protection in prisons accompanied with an efficient mechanism of inner and outer control of its functioning is also important for the prevention of another type of crime – torture of prisoners committed by the members of prison staff. Independent health service and medical staff of high personal and professional integrity are supposed to facilitate discovering, proving, preventing and sanctioning the cases of torture i.e. inhumane or degrading treatment of prisoners inside the penitentiary institutions.

Genuine state of health protection in Serbian prisons can be depicted through the reports of the Ombudsperson, the Administration for the Execution of Criminal Sanctions and relevant international organizations. These documents show that there is still a serious gap between normative framework and reality in this field due to overcrowded institutions, limited financial resources, lack of medical equipment and insufficient number of professional medical staff. Although no individual cases of torture have been reported, these reports suggest that general conditions under which prisoners are kept are sometimes so inhumane and degrading that they resemble and can be treated as torture. The number of HIV and Hepatitis B and C infected prisoners should cause concern, particularly if the unregistered cases are taken into considerations. This issue should be given more attention, as well as the problem of psychoactive substance abuse and the lack of a comprehensive approach to the treatment of drug-abusers in prisons. In spite of constant efforts to improve current state regarding the health of prisoners through cooperation with the Ministry of Health, organizing more frequent testing on HIV and Hepatitis B and C,

57 Konstantinović Vilić, S., Kostić, M. (2011). *Sistem izvršenja krivičnih sankcija i penalni tretman u Srbiji*, Niš: Sven, 32 – 34.

58 See: Batrićević, A. (2011). Zaštitnik građana i poštovanje prava zatvorenika u Republici Srbiji, *Branich*, 124 (1-2), 135-156.

59 Soković, S. (2005). Izvršenje kazne zatvora – relevantni međunarodni pravni standardi. *Pravni život – časopis za pravnu teoriju i praksu*, 54 (9), 714.



education of prisoners on risks of sexually transmittable diseases, establishment of „drug free departments“, investing in some parts of equipment etc., the actual state of prisoners' health and standards regarding medical care of prisoners in Serbia are far away from those prescribed and considered acceptable by International documents and our national legal framework. The improvement of current situation in this field would require a holistic approach starting from the allocation of financial resources, organization of inner and outer control of functioning of health care services within the penitentiary institutions, education on the importance of health protection and prevention and raising awareness on the contribution of adequate health care of prisoners to crime suppression and prevention of recidivism.

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## POVERTY AND THE CONSEQUENCES OF POVERTY

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**Abstract:** This article discusses the state of poverty through deprivations, risk society and social exclusion, which are the composites of the aspects of society and can be defined especially in the term of security/insecurity. In the causal sense of poverty, the social crisis is the first stadium which arises, and which, by definition, has short-time duration and it is followed by the risk society, then social exclusion, and finally the deprivations. We want to stress that the deprivations can have reversible impact on the state of society, but they can also become the frame for appearance of social insecurity.

**Keywords:** poverty, deprivations, risk society, social crises, social exclusion, security

### POVERTY

Anthony Giddens, in his influential course book *Sociology*, defines poverty, social assistance and social exclusion as multifactor social facts<sup>1</sup>, and the most important aspects are:

There are two different ways of understanding poverty. Absolute poverty refers to the absence of basic resources necessary for maintaining health and physical functions. Relative poverty refers to the assessment of gap between life conditions of some groups and those of the majority of population.

In many countries poverty is officially measured according to the limit below which it is said people live in poverty. Subjective measuring of poverty is based on personal apprehension of necessities for an acceptable life standard.

Inequalities between the rich and poor have dramatically increased as the consequence of state politics, changes in professional structure and unemployment. The poor are a diverse group, but it is more probable that the individuals unprivileged in other life aspects (e.g. the elder, the ill, children, women and ethnic minorities) are going to be poor.

There are two main approaches of explaining poverty. Arguments for culture of poverty and dependence claim that the poor are responsible for their own unprivileged situation. Due to the lack of qualifications or motivation, or moral weakness, the poor are not able to succeed in the society. Some of them become dependent on external help, as the social assistance, instead of helping themselves. The other approach claims that poverty is a consequence of wider social processes that distribute resources unequally and create conditions hard to adapt. Poverty is not a consequence of individual deficiencies; it is a consequence of wider structural inequalities.

Poverty is not a permanent state. Many living in poverty may find a way out of it; however it can last only in the short term. Moving in and out of poverty is more dramatic than it seemed before.

Subclasses are a part of population living in extremely poor conditions, at the margins of society. The concept of subclasses has been used for the first time in the USA for describing the position of poor ethnic minorities in urban areas.

Social exclusion is referred to the process in which individuals are not entirely included in the broader society. People, who are socially excluded, due to bad accommodation, deficient

<sup>1</sup> Giddens, A., & Birdsall, K. (2007). *Sociologija*. (pp. 308-344). Zagreb: Nakladništvo Globus.

schools or limited transportation, can be deprived of self-development opportunities normally available to the most of the society. Homelessness is one of the most extreme forms of social exclusion.

Social countries are those in which the government has the central importance in reducing inequalities among citizens by subventions granted for specified goods and services. Social services differ across countries, but often include education, public health, habitation, income allowance, unemployment benefits, disability compensation and pension.

In social countries which enable general social care, social assistance in the time of penury is a right granted to everyone, regardless of the income or social status. Conditional social care, in contrast, is a benefit only for some individuals whose "eligibility" is determined based on the income and savings. In most of industrial countries, the future of social services is being discussed. Some believe that these services should be common and well-funded; others emphasize that these services should serve only as insurance for those that cannot be helped in any other way.

M. Haralambos, in the section "Poverty and social exclusion"<sup>2</sup> of a course book, starts the discussion with differentiating absolute and relative poverty. Absolute poverty is poverty at the margin of survival or existence, whereas relative poverty refers to lack of basic consumer goods in the country, i.e. a person can have a car and be poor at the same time. In many studies, the consequences of poverty are mainly considered to be unemployment, low salaries, old age, illness, death of the bread winner and a large family<sup>3</sup>. The way of measuring poverty is very interesting because it involves a number of everyday symbolic rituals, such as fishing, different hobbies etc. The idea is that the poverty is measured through elements of free time and every day and to ascertain whether the persons have time and money. Index of deprivation includes the following facts:

Last 12 months every weekend spent at home.

Adults only: last 4 weeks no relative or friend visits for meal or snack.

Adults only: last 4 weeks no visits to friends or relatives for meal or snack.

Children only (under the age of 15): last 4 weeks no friend visits.

Children only: last birthday not celebrated.

Last 2 weeks no afternoon or evening outings.

Fresh meat not consumed more than 4 times a week (including meals outside)

Last 15 days, one or more days no cooked meal.

No refrigerator at home.

The family usually does not gather together at Sunday lunch.

The family does not own a sink or tap with warm water; bath or shower; gas or electric stove.

## CULTURE OF POVERTY

Poverty is culture or way of living which is transferred through generation. Poverty strongly develops feeling of minority, dependence and inferiority, and it is directed to present time and to appeal of temporarily satisfaction. The essence of poverty is in multiplication of incompetence, and probability that incompetence would cause another one. Long lasting poverty contributed to strong feeling of identification with poverty; poverty is not hidden any more, it becomes stereotypical. Population in poverty are highly appropriate material for political manipulation and it is a field where it is possible to implement tide and partial political determination. Most of the population are in urban poverty, where surviving is mediated by institutions.

The culture of poverty is theoretical term of American anthropologists during the 50's of last century, especially Oscar Lewis<sup>4</sup>. There are two reasons for development of term "culture of poverty". First, it has been noted that most of the people in poverty zones react similar:

Deep feeling of minority;

Helplessness;

Addiction and inferiority;

2 Haralambos, M., & Heald, R. (1989). Uvod u sociologiju. (pp. 423-432). Zagreb: Globus, Posebna izdanja.

3 Townsend, P. (1979). *Poverty in the United Kingdom*. (p. 250). Harmondsworth: Penguin.

4 Lewis, O. (1959). *Five Families*. (pp. 9-14). New York: Basic Books.

Minor organizational stage;  
 Strong orientation to present time;  
 Incapability of dissatisfaction delay;  
 Fatalism;

In broken families, or dysfunctional families, strong orientation of children to their mothers.

Second, specified characteristics are socially transferable to younger population and they are stigmatic, notwithstanding in some cases direct circumstances of poverty are vanished. The syntagm "culture of poverty" has been used by Oscar Lewis and popularized by Michael Harrington<sup>5</sup>. Between many, Herbert Gans<sup>6</sup>, Walter B. Miller<sup>7</sup> and Lee Rainwater<sup>8</sup> discussion about "culture of lower race", represents sources which are referred conceptually to this term. Basic cultural directionality to value of work and consumption and structural assets for that achievement, leads to acquiescence between society and its actors. However, incompatibility between cultural defined values and structural assets for its achievement leads to anomie. Theory opposite of culture of poverty is theory of situational enforces (Elliot Liebow, "Tally's Corner" according to Haralambos&Holborn, 2002)<sup>9</sup>. Theorists of this orientation notice that population in poverty has following characteristics:

Low paid jobs,

Jobs which they despise as much as their employers;

Defect time orientation and absence of capability in making time for better job; That is also a reason for high rate of divorcement, because of incapability to keep spouse and family;

Their behavior is product of enforcement and situation defined.

According to Marxian inquires, poverty is the result of society class division and it is a permanent follower of capitalism society, and it can be eliminated by self-eliminating of society class structure. Max Weber proves that individual class situation depends on his market situation, and quantity of power that individual has, influencing on market activities for his own benefit. The price is result of his skills and competence which he achieves in competitive market.

Poverty is transferable to alimony population (seniors, patients, invalids), but only for the following reason: Majority of that population has already been dependent to jobs which could not provide almost any funds to recline. Mainly, their poverty is the continuation of poverty which remained from low paid jobs. The impoverish of working class is noticed in legal tendency in majoring proletarianization of population, in suppress, neutralization, disqualification, in working manpower desocialization, in exploitation and over exploitation, and in working manpower value decreasing, and in spreading of misery through increasing number of society members.

Recent poverty researches suggest that poor working class mainly has weak negotiation power, which is also confirming their poverty.

## DEPRIVATIONS

Beside other, significant results of poverty are deprivations, and they might be one of the criteria for society secure/unsecure. Simple, but precise, definition of deprivations is that those are conditions of deficiency, and certain sign of unaccomplished goals and unsatisfied needs of individuals, groups and collectivities.

Deprivations are arising directly from contents which cause impossibility of creating own life destiny, filled by feeling of moral turndown and different types of personality degradation, and potential relationships which individual could create. Deprivations will always arise in case of distraction of common harmony in satisfaction and achieving goals. Presented model suggests that cycle, in which we notice that level of satisfied needs and goals, is the problem.

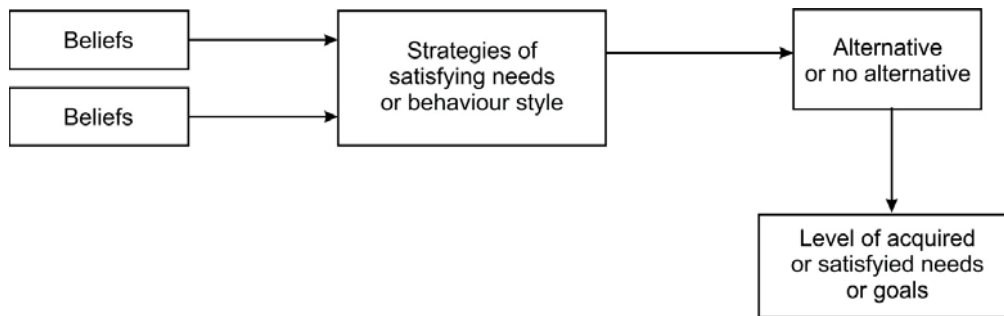
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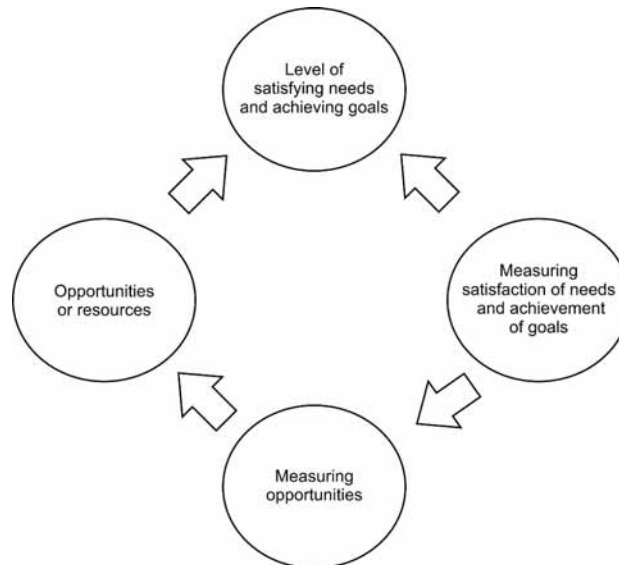
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### ***Model of satisfying needs and achieving goals***

Connective tissue of this model is behavior, as a function of satisfying needs and goals. Based on beliefs and assessments that some needs can be satisfied and some goals achieved, a type of strategic behavior is formed. If one type of behavior shows to be dysfunctional, alternatives are chosen. In discourse of deprivations in this aspect, often there is no alternative. The assumption is that the type of behavior without alternative tough has its function, known as learned helplessness or multiplied disability. This attitude is connected with the neoclassical theory of economy, coming from Adam Smith.

To note the disparity between defined needs and goals, it is necessary to compare it with another model which measures real resources used for satisfying the same needs and goals. In reality, especially in high risk and poor societies, this disparity is large; defined and formed needs for which there are minimum resources available.



### ***Model of satisfying needs and achieving goals***

Deprivations are strongly felt by persons who had settled social and material continuity in working life segments, but they affect almost all subjects in extreme cases. Deprivations, regardless of their presence compared to life standard or as a result of subjective feeling of a deprived person, are generally reflection of feeling anxiety, inability of choice, equability and leveling that disable status differentiation, which in case of most people create the foundation of personality. This is especially present in cultures in which value systems material status represents one of the dominant values. Deprivations come out of situations in which a great number of people are reduced to the same or similar status component, meaning that many status differ-



ences under deprivation pressure become irrelevant. In these situations, status of an individual and collectivity, depends mostly upon how efficient and at what cost is the individual ready to defend its dignity.

Behavioral theory of deprivation states that, so called deprivation behavior is possible, directed to those same behaviors, but if extended through time perspective, than it can have aspects of behavior that can be defined as a blockade strategy of any potential deprivations. Deprivations can end steady behavioral sequences that were positively supported by the social environment, resulting in disorientation (e.g. loss of job can result in loss of interest for other persons). Cognitive theory of deprivation recognizes behavior as a result of thinking processes including self-definition, collective memory, performance and expectations.

The most important is the T.B. Beck's theory which includes negative attitude about itself, about the situation and future<sup>10</sup>. Persons and collectivities interpret facts in a negative way, focusing on negative situation aspects and leave no hope for the future.

The Martin Seligman theory states that, when a person is exposed to sudden and unexpected deprivations, he or she does not have the ability to respond qualitative to the deprivation condition<sup>11</sup>. The past, as the time of no deprivation, becomes the only time dimension in which everything that is important happened. Present and future do not exist. Risk factors contributing deprivations in the long term, and accordingly factors of general uncertainty, are:

Inherited problems that have not been solved in the past

Age

Sex

Lack of social assistance

Empirical research can show a range of variations between assigned goals and their realization. Hypothesis is that the larger the range, the greater the uncertainty. Important are the alternative or no-alternative behaviors and strategies. The goals become personalized and move away from the collectivity. The more often these processes happen, the greater the uncertainty. This indicates weak social cohesion and deprivation. It can easily be seen from the model that needs satisfaction and goals achievement significantly depend upon real opportunities and resources and that the correlation tends to be very low implicating greater uncertainty.

Poverty can be considered independent variable. Since this is a dynamic model of understanding life situation, dependent, explanatory and intervening variables behave as marks tending to autonomy. That means that deprivations, caused by poverty, tend to behave relatively autonomous in the experience of an individual.

Consider briefly the meaning of a variable. Variable is a measurable aspect of phenomena and the goal is to emphasize the opportunities of its measurement, to explain it and to observe it. Assessment and measurement of a variable starts with the process of recognizing the circumstances in which it occurs and how it manifests. When defining a deprivation, we always assume that it is the reality or a certain reaction in a situation inside of the social reality. Reality of deprivations is that they are the consequences of a series of states of deprivations. Signs of variable are considered to be those elements on the basis of which we state whether and to what measure the variable is real or hypothetic. The strategy of creating the list of variable indicators usually starts with ascertaining broader aspects at which it can be recognizable. Out of the broader components, narrower and more concrete meanings are allocated. Besides the variable indicators, criteria of frequency, quality, quantity, width, strength, velocity and duration indicators are considered<sup>12</sup>. Determining the frequency degree of these indicators is based on the rule that the variable is more present if the indicator occurs more often. At determining the degree of variable presence, the nature of its quality can be used, meaning that some indicators are more reliable, consistent and real than others. Number of indicators, as a measure of frequency degree of a variable, is used as a fact indicating its complexity. That effect, indicators point a wide range of variable detection or its main parts, more than some other sign. Variable indicators might be present in high or low quantity, and by that point on its higher or lower presence. Velocity of

10 Beck, T. B., Freeman, A., & Davis, D. D. (2003). *Cognitive therapy of personality disorders*. (second edition ed., pp. 198-212). New York: Guilford Publications, Incorporated.

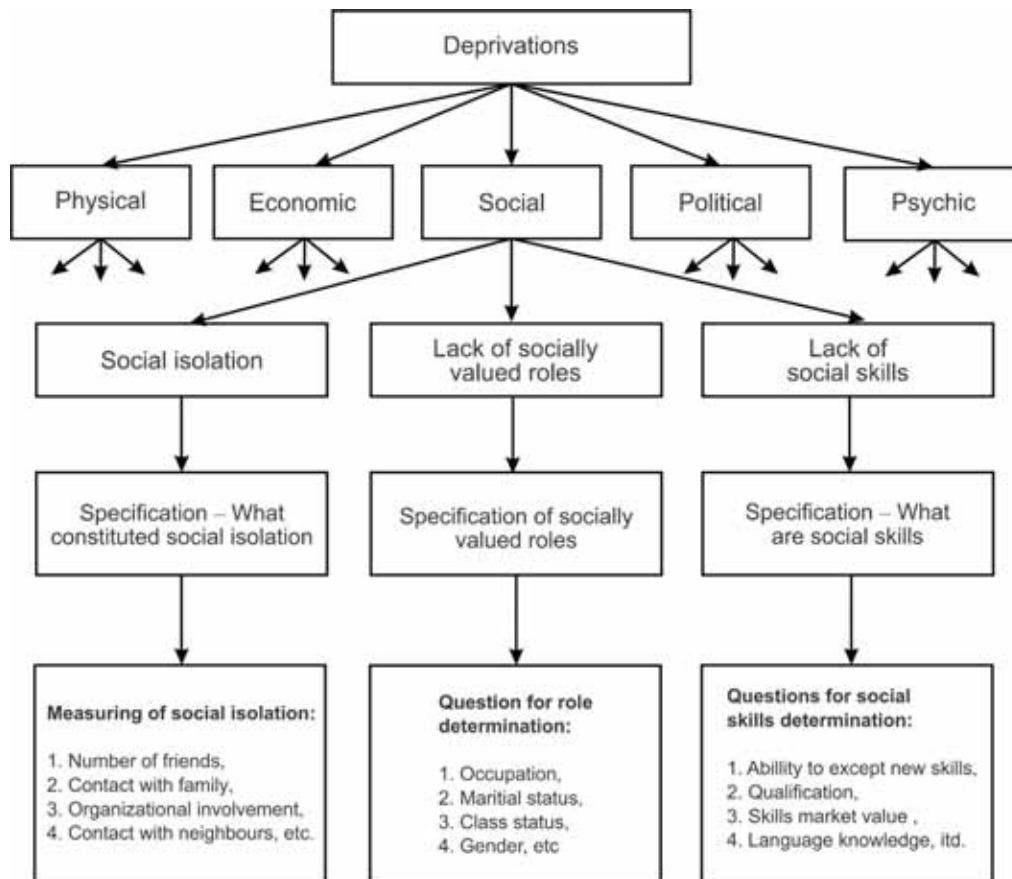
11 Seligman, M. (1992). *Helplessness: On Depression, Development, and Death*. (pp.18-23). New York: W.H. Freeman & Company.

12 Bukvić, A. (1982). *Načela izradepsihološkijestova*. (27-67). Beograd: Zavod za udžbenike i nastavna sredstva



indicators appearance is considered as criteria of variable detection rate. Meaning, if one consequence has determinate faster, insofar, its variable is more present. Duration of indicators, as criteria, determinate higher or lower variable presence. Term of variable measuring also means its quantification in continuum of reality. Volume or generality of variable, determinate higher or lower diversity and variety of detection aspects, included by variable. Insofar as less variable volume, inasmuch it included less different behavior, and vice versa. Regarding the possibility of determination variable by group of indicators, variable volume has reflected in number of narrow variables, which is number of variables as result of variable dissolution. That is an inducement for variable complexity. Variable universality implies broadening variable in specific collectivity through temporal and spatial perspective. Variable is more universal, if presence in one collectivity is more independent then possible ways of grouping its members. Variable duration is characteristic which has to be noticed in accordance to reliable measuring methods and overview of factors which cause it.

Deprivations in social context are present mostly through individuals, groups and collectivities inability to realize defined needs and goals. Through presented model deprivations analysis, we noticed that variable universe does not deplete by simple state of deprivation, but has larger aspects.

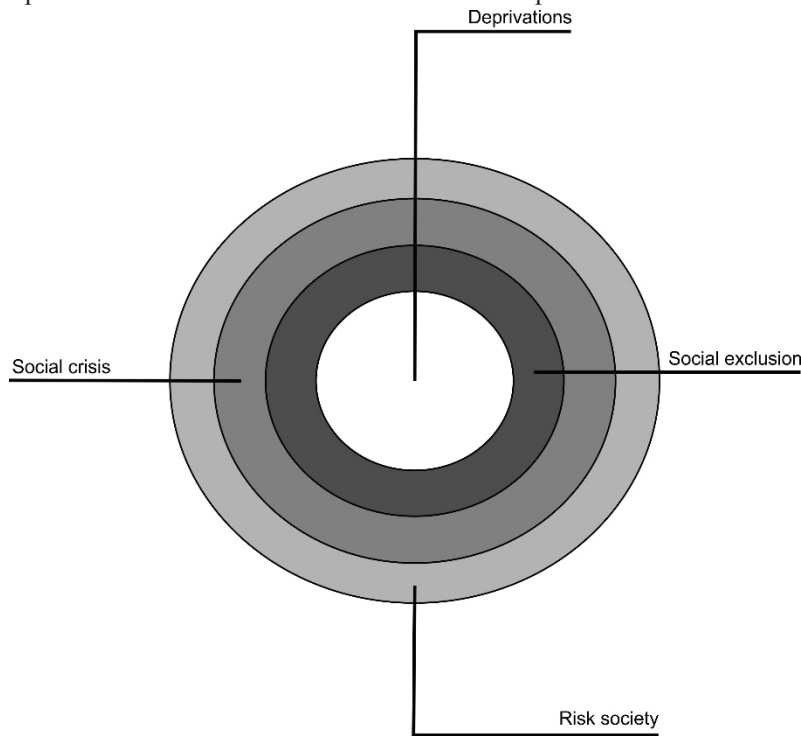


#### ***Model for analyzing deprivations***

However, deprivations are not an independent social phenomenon. They occur in context of broader social perspectives and conditions, but individuals, groups and collectivities are those that feel them the most. Multiplied mass of individuals in state of deprivation create or implicate significant social risks. Number of states and processes are mutually supporting, revitalizing

and confirming itself, but we consider that, after poverty as a generalized factor of reality, social risk as the broadest aspect of reality, social crisis, social exclusion and relatively the narrowest and most concrete consequence of all these states are deprivations, somehow the beginning and duration of deprivations being a constant in all derived social poverty products.

Here we present the scheme of the structural derivations position in relation to its sources.



*Structural derivations position in relation to its sources*

**RISK SOCIETY**

The paradigm risk society aims to theoretically consider different aspect of risk and to ontologically determine which reality of social risk belongs to which society. Society risk theories occur within theory of modernity and post modernity as a state that cannot be controlled or state that causes unintentional consequences. Modern social reflection highlights the knowledge of risk jointly with the phenomena of uncertainty and absence of opportunities for future states control. The feeling of lack of control over future states brings even more confusion into the complexity of demand for overcoming this society feature, and creating more stable society forms<sup>13</sup>.

Since the transitional and post-socialist societies of Balkan (B&H, Serbia, Kosovo, Macedonia etc) are at risk, referring to explicit poverty and public misery, it would be theoretically very important to research the most significant consequences and autonomous forms of those consequences or social poverty products. It may seem to be also risky societies, besides the deprivations. Namely, social instability, unpredictability und inconsistency altogether produce, create and accumulate new social experiences, fragmenting and violating past experiences which were, for the average population, operationalized in disrupted roles, statuses, identities, security and represents interpretation mainframe for understanding the content of poverty.

Environment of social changes in the named societies favors structuring and dominating poverty, consequently favoring also the risk society. Perception and definition of an average

<sup>13</sup> Miles, S. (2001). *Social Theory in the Real World*. (pp.12). Thousand Oaks, Sage

population is the answer to what is happening in risk society and what are the salient situations, models, categories and meanings of these states. Analysis of these answers gives the answer to question which events, values, attitudes, beliefs and elements of identity are being mobilized in the process of creating adaptive strategies for the given state. Together with this demand, we join the demand for determining strategies of different status groups.

Space distribution of poverty, deprivation and risk are also important, first of all because of the fact that the named states and processes are differently and class distributed in space, because these variables indicate poverty as a general factor of social life. Argument for this discussion is supported by theoretical insights of criminology and urbanology<sup>14</sup>.

Who are the classic poverty victims and how do new victims appear? They usually occur in suddenly impoverished societies with strong deprivations and increasing risks. What is the knowledge diffusion about poverty and what are the main institutions organized for this state and at what rationale they enroll themselves in the everyday practice, are important issues both for the theory and the practice. These insights prove the discourse and manner of configuration for the institutional infrastructure.

Size of the risk depends greatly upon the character of the society, pursuant to that also the size of risk control. Given the lack of opportunities for adequate consumption articulation and employment for the most part of working-capable population, it is possible to claim that the aspect of risk society in mentioned societies for most actually means absence of human freedom aspects.

In risk society, social life is significantly permeated by institutional infrastructure of risk (institutions which are dealing with risk groups), and population they deal with are more massive. Those population become standardized larger, and probably more problematic, so that differences between classical and emerging socially problematic risk groups gradually disappear.

Deprivations and risk society overlap in reality, so that stated situation means also strike to individuality. An individual situation is reflecting through institutional situation. That creates specific destiny for the person in identity with institutions which statistically treat its destiny, e.g. Social Work Center or hospital represent institutional connection between their benefits and society. In case of dysfunctionality of this relationship, it is directly applied to social help benefits, or medical services benefits, in terms of supporting and expected pathology. Thus, an individual totally depends on social and health policy, economic instability and market, so individuality appears simplified word about himself. Thus, an individual becomes the same as institution, what causes highly politicized possibility of individuality structuring<sup>15</sup>.

Ulrich Beck's observation of risk society<sup>16</sup> indicates that individual's responsibility for lack of his individuality is based on institutional reality, and, in this context, it is based on dysfunctionality, too. Personal destiny or situation is assigned to institutions, which fund knowledge about risk and manage it. Meaning, an individual is incapable to influence the institutional risk leading, and, as Beck says, it is like subjects are "naturally determined" to incline towards system.

Key aspect of risk society is in uncertainty of survival, expressed in absence of economic or institutional support, and in reproduction of unpredictability. That contributes obvious inequalities, resulted on risk basic, as a potential for further risk (e.g. ethnic elite takeover the role of arranging new social complexities, which are essentially different from conditions in which they affirmed). Risk society significantly converges with criminality as potential answer to that particular condition. We consider that type of research is, not only theoretically significant, but applicative also. Meaning, actions and social movements might be initiated on that basis, making easier to predict and control state of risk. Recent criminology especially emphasizes risk society as reference for criminality development<sup>17</sup>.

A. Giddens's risk theory has significant implications for our understanding of risk theory<sup>18</sup>. This author considers that source of risk is composed mostly by unreliability of instruments,

14 Bottoms, A., & Wiles, P. (1992). Explanations of crime and place. In D. Evans, R. Fyfe & T. Herbert (Eds.), *Crime policing and place: essays in environmental criminology* (pp. 11-30). London: Routledge

15 Furlong, A., Cartmel, F. (1977). *Young People and Social change: Individualization and Risk in Late Modernity*. (pp.42-45). Buckingham: Open University Press

16 Beck, U. (2001.). *Rizično društvo: u susret novoj modernosti*. (pp. 18-32). Beograd: Filip Višnjić.

17 Ericson, V.R., Hagerty, K.D. (1997). *Policing the risk society*. (pp. 18-23). Oxford, Clarendon Press

18 Giddens, A. (1991). *Modernity and Self-Identity: Self and Society in the Late Modernity*. (pp.12). Cambridge: Polity

frames and resorts for leading settled social life. Simply, if social changes mean only social changes, they resulted by expediency and destruction of commonly social form.

Tautology of social change, and not her mobility, states that the social change is the purpose for itself, it disorganizes an individual and his identity, and it significantly forms it in direction of existential anxiety and ontological insecurity. Mass production of those states results in general inability to perform desired social changes and reduce risk in predictable categories.

Theory should synthesize those society characteristics that are qualified as risk society caused by poverty and those narratives that will continue defining it, as well as ways at which the phenomena tends to acquire certain autonomy in contrast to other social processes. It is considered that the quantitative-qualitative approach of analyzing phenomena of risk society in its main appearing formations, especially if it properly shows the relation space-place-social change-social risk, is a good basis for creating practical interventions<sup>19</sup>. Starting with the fact that the theory hasn't declared itself about the problem to the utmost, the term should be distinguished with the aim of gripping experience of the actors that are at most included in the social risk. Theory has proved that it makes sense to search for correspondent processes caused by social changes, so it can be understood in this way how tensions representing the main analytical interests, are being created.

### SOCIAL EXCLUSION

Social exclusion is also a phenomenon in structural relation with the process of deprivation. Social exclusion of an individual and a group can begin with long term unemployment, homelessness, inadequate qualification for labor market, discrimination, sex, age, religion or complex changes caused by new technologies and forms of communication. Some factors can have primary meaning, some secondary, mostly influencing together the process of social exclusion. Exclusion can be understood as "situation which includes several deprivation dimensions: type of poverty constructed inside the society structure and irrelevant to the ruling population."<sup>20</sup> Term of social exclusion coincided with the observation that the problem is important, obvious and mass, especially for populations located in urban centers.

A relatively long period of time, P. Townsend's conception of poverty was influential "... that can be understood as relative deprivation – by which we consider absence or lack of type of nutrition, comfort, standard, services and activities that are common and usual in the society"<sup>21</sup>.

Townsend alerts the relative poverty nature, meaning that different aspects of poverty express even through a limited approach of participation in common and usual society practices. In basis, this is the so called distributive mainframe of resource allocation.

Europe Commission, inspired by the relation aspects of poverty emphasized in P. Townsend's opinion, came to the following key provisions about the problem and term of poverty and social exclusion:

- changed nature of understanding new poverty and marginalization forms
- social exclusion has a structural nature
- increase of insecurity is related to the economic crisis
- numerous situations of exclusion are derivatives of economic, technical and social changes characteristic for the evolution of industrial changes
- the problem is not only in the systematic disparity of classes (up/down), but between standardized commodities and those at the margin of existence (in/out)

Commission considers the process of social exclusion a dynamical process with emphasis on the consequences and its multidimensionality. That means that understanding isn't exclusively focused on the economic condition. Forms of social exclusion happen in the sphere of exclusion from social changes, practice and social integration rights and identity, habitation, education, general health status and service access. Named weaknesses or inabilities often act cumulative and in perspective not only people get influenced, but also regions. Multidimensional phenomenology of exclusion suggests that it is meaningless to solve one aspect if so many others are left problematic.

<sup>19</sup> Douglas, M. (1992). *Risk and Blame: Essays in Cultural Theory*. (pp.31-33), London: Routledge

<sup>20</sup> Social Europe, (1993). General for employment, industrial relations and social affairs (Supplement 4/93). Brussels

<sup>21</sup> Townsend, P. (1979). *Poverty in the United Kingdom*. (p. 250). Harmondsworth: Penguin

In this sense Heinz Steinert considers the process of social exclusion is never unambiguous, but that the actors that are excluded are very competitive and can actualize resources available<sup>22</sup>.

The discussion suggests that the universe of variable of poverty depends upon a number of components, and we have focused on deprivations, risk society and social exclusion as consequences of this condition/state. It is obvious that poverty is being extended through time-space perspective and affects mostly, at first exclusion of population parts that are dependent, and then the most qualitative part of population that creates fortune. Since this is a complex variable, it is sensitive to every form of rebalance, risk and social isolation in other life components. Besides that, analysis suggests that it is possible to compose the term of poverty management. These factors that organize, cause and create poverty at the same time compose the level of security/insecurity.

### IMPLICATIONS

As poverty becomes more massive, more unpredictable and uncontrolled, insecurity in that society gets higher;

Poverty management is in tide correlation with management of deprivations, risks and social isolation, and ultimately, insecurity, too;

Poverty and its conditions are powerful instrument in creating social construction of fear, and easily could be misused, as real conditions;

One way of ruling of individuals, groups and collectivities poverty, is promoting extern and unimportant causes of deprivation.

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## THE MEASURING AND ANALYSIS OF ORGANIZED CRIME

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**Abstract:** The paper deals with the problem of getting an accurate picture of crime, including organized, transnational or complex crimes, on a worldwide scale. Organized crime is the only criminal segment where we cannot point out any single criterion, pertaining to every crime within its framework, or to every actor of organized crime. The widest variety of criminal actions is performed within the structure of organized crime, ranging from official and acquisitive to violent and sexual. So measuring the extent of transnational organized crime becomes complicated by the different nature of these types of crime, and also by some divergence of the definitions of organized crime in domestic criminal law and the science of criminology. The paper is based on some recent works of Russian academic criminologists, and on the documents of UN dedicated to the international cooperation in the countering organized crime, as well as on the results of researches done by the author herself.

**Keywords:** Organized crime, measuring, statistics.

## THE CONCEPTION OF ORGANIZED CRIME AS A SOCIAL AND CRIMINOLOGICAL PHENOMENON

Organized crime has become nowadays one of the most dangerous threats to security and the welfare of nations. Delivering a paper at 12<sup>th</sup> United Nations Congress on Crime Prevention and Criminal Justice (2010), Antonio Maria Costa, Executive Director of the United Nations Office on Drugs and Crime, had to state that, “unlike in other domains where the UN is the world’s best information provider, we don’t have the definitions, data and logical framework to report on crime trends, understand its causes and measure its size”, and that all we saw were the consequences, the material costs and the suffering caused by crime; especially it refers to organized crime. But without any progress in this field we cannot judge whether our policies are succeeding or not<sup>1</sup>.

We may say that the organized crime phenomenon leaves an impression of some virtual space where crimes are committed. It’s a philosophical concept rather than territorial. By this we mean that the contact of organized criminal associations, at least on the information level, ties them up into something more than merely statistical totality: it’s an ordered totality, a system subject to irregularities in a far lesser degree than any other totality within the criminal framework. Any crime committed in the area of organized crime brings forth the chain reaction of criminal activity of other persons and communities, since it is inevitably connected with distribution or redistribution of spheres of influence or objects of profit extraction. Currently, when the system of organized crime is already formed, any crime within the organized criminal frameworks breaks the fragile short-term balance inside this system.

If other types of criminal manifestations exist in a kind of world parallel to the life of law-abiding part of society, or runs counter to it, organized crime actively edges into the life of society and strives to bring public mechanisms under control: it coalesces with government, organized crime representatives lobby political decisions favorable to them – by bribes, establishing firm long-standing relations with government officials, even by personal penetration into echelons of power; also the block policies unprofitable to them.

No other criminal manifestations affect politics, i.e. social life and the state to such extent as organized crime. Even official malfeasances are, after all, “a necessary evil” in the structure of power,

<sup>1</sup> Costa A.M. No Security or Development Without Justice// Twelfth United Nations Congress on Crime Prevention and Criminal Justice (Salvador, Brazil, 18 April 2010). –UNIS/CP/611. Retrieved from [http://www.un.org/en/conf/crimecongress2010/pdf/pr\\_100418-2.pdf](http://www.un.org/en/conf/crimecongress2010/pdf/pr_100418-2.pdf).

a kind of natural detriment, enshrined by the very nature of power: under no social system, never and nowhere it is free from abuse. But official malfeasances by themselves, although running against the interests of the state and society and infract normal functioning of state apparatus, are amenable to control and inhibition. But once they become part of organized criminal activity, one of its instruments – and they, as well as the totality to which they are part of, get out of social control and multiply increase their destructive influence on society. To sum up, all other crimes, except organized criminal activity, are mere segments in the structure of crime. They are grouped according to some basic feature pertaining to the body of the crime: official malfeasances are statistically integrated by special actor, acquisitive crimes – by their gainful motive and objective, sexual – by motive of achieving sexual gratification; juvenile crime, manifold in structure, is characterized by the under-18 age of actors, etc.

Organized crime is the only criminal segment where we cannot point out any single criterion, pertaining to every crime within its framework, or to every actor of organized crime. The widest variety of criminal actions is performed within the structure of organized crime, ranging from official and acquisitive to violent and sexual (we may, probably, exclude crimes with motives and objectives totally opposed to those of organized crime, e.g. terrorism. Although we can admit that members of organized criminal community may finance terrorism if they expect to profit from it in future<sup>2</sup>). Besides, different persons of both sexes and almost any age, including juveniles, belonging to any social strata may be actors in organized crime. All that features strongly complicate the exposure of organized criminal activity from the whole massive of crimes, and measuring it, because the concept of organized crime is not an equivalent of the concept of the organized criminal group, as well as an organized criminal group is not a synonym of an organized criminal association.

To use a commonplace metaphor, organized crime is like a ramous circuit, covering all our existence as a spider web. Since you cannot live in a society and be free from it, no individual in contemporary social environment is free from the presence of organized crime in his or her life. Every human, of whatever age and social status, is influenced by organized crime. Its representatives own markets where women buy food, leisure spots where young people spend their time, workshops and offices where fathers of the families work. Mass culture, totally embracing minds and souls of social environment, imposes upon us the image of organized crime participants, with varying degrees of sympathy towards these characters; anyway, TV, radio and other mass media, cinema, theater and literature, does not allow us to disengage ourselves from organized crime phenomenon. And this is the mildest, relatively harmless form of contact. Harsher forms of contacts with organized crime are faced by those who, not being organized crime participants, experience its manifestations: e.g. when schoolchildren buy drugs, distributed by organized crime communities, entrepreneurs suffering from protection racket, enforced take-overs, random people getting killed or wounded during criminal showdowns, etc. The General Secretary's report on basic tendencies and events in the field of crime for the period from the 11<sup>th</sup> UN Congress on Crime Prevention and Criminal Justice, delivered at the 12<sup>th</sup> UN Congress in April 2010, states: "Transnational organized crime is facilitated by corruption at many levels, and is mostly limited to the areas in which the organized crime groups operate. Most people may feel that they have never come into direct contact with these types of criminal elements, but the links between organized and petty or conventional crime are close. Crimes such as burglary, robbery and assault frequently become part of the modus operandi of groups involved in transnational organized crime, heavily affecting the lives of victims. Indeed, crime represents one of the most serious causes of disability. In some countries, interpersonal violence is as frequent a cause of disability as road traffic accidents"<sup>3</sup>.

Organized crime is in fact radically different from other types of crime in the sense that all members of organized criminal activity are connected in this or that way, both informationally and organizationally: each organized criminal group knows about the existence of other groups, about the objects from which other groups extract illegal income, about the leaders heading

2 While working on the text of United Nations Convention against Transnational Organized Crime representatives of some states insisted on the including the terrorism into the list of crimes pertaining to the organized criminal activities. However, this proposition was turned out by the majority with references to UN initiatives of fighting terrorism – and to the fact that an attempt to define terrorism would divert attention from other issues.

3 State of crime and criminal justice worldwide/ Report of the Secretary-General//Twelfth United Nations Congress on Crime Prevention and Criminal Justice (Salvador, Brazil, 12-19 April 2010). –A/CONF.213/3. Retrieved from <http://www.un.org/ru/conf/crimecongress2010/>.

other groups. It is necessary for them in the first place because they need to divide spheres of influence and regulate illegal income extraction. However, most conspicuous members of criminal units are known at least in their region, and the strongest groups are known outside the region. And if the criminal interests of organized criminal associations intersect or adjoin, the information exchange takes place on the inter-regional, federal and even international levels.

Besides, leaders and active members of organized criminal associations are known not only in criminal and law-enforcing circles but to the general public as well. Vladimir Kumarin (Barsukov) had been known in and outside St. Petersburg long before he was arrested on suspicion of committing felonies within a criminal organization. And people knew him neither as a director of a major fuel company of Northern-West region nor the head of Disabled Persons Rehabilitation and Support Foundation (he was actually holding these positions), nor as the patron of the Tambov cruiser, who saved the ship from destruction, but as the leader of the so-called Tambov criminal association. The law-enforcement agencies had all these data, and Kumarin was actively positioned in mass-media as a criminal boss<sup>4</sup>. (Due to frequent mentions in publications dealing with crime his name became quite denominative, he changed it from Kumarin to Barsukov, his mother's maiden name).

In January 2013 Aslan Usoyan, known to Russian public by his criminal monicker Grandad Hassan, multiply convicted, "crowned" in criminal traditions in 1968, i.e. awarded the title of "vor v zakone" (gangland eminence), the highest in criminal hierarchy, was killed in Moscow. The press characterized him as "the most prominent and influential underworld representative at post-Soviet territory"<sup>5</sup>. The murder and Usoyan's funeral were covered by all top news agencies of Russia, the reports on these events made front pages in most newspapers. But none of mentioned or others many notorious leaders of organized criminal nets had been brought in a verdict of guilty for organizing and directing a criminal association (which is punished more seriously than conducting the criminal group, because the association is much more dangerous form of criminal cooperation, consolidating several criminal groups). So the official statistics had not taken stock of them as of the leaders of organized criminal associations.

But the above-mentioned features of organized crime, such as tight connections between the organized criminal associations on the information level, close attention of the press and common people to the manifestations of organized crime and notorious "godfathers", etc., can help to get a more truthful, reliable picture of crime, than the official statistics is able to offer. Though it demands some special tools of research.

## INSTRUMENTS FOR COUNTERING AND ANALYSING THE ORGANIZED CRIME IN RUSSIAN FEDERATION

The existing of organized crime in Soviet Union had been admitted officially not earlier than in the late eighties of XX century. Since that time the criminological researches in the field of organized crime had been planned and carried out by state scientific institutes and criminologists in Russia, such as A.Dolgova<sup>6</sup>, V.Ovchinskiy<sup>7</sup>, etc.

In 1997 the new Russian Federation's Criminal Code (RFCC) was put in force, supplied with some articles established the participation in the organized criminal association or directing such an activity as serious criminal offences (Art.210 of RFCC), punishable up to maximum deprivation of liberty (that may mean life sentence), even if no other felonies have been committed after the achieving a collusion between some persons to commit serious crimes.

Not only legislative, but other measures were adopted as well: the special Federal Anti-Organized Crime Department has been established in the nineties of XX century, and became soon the elite subdivision of the Criminal Investigation Police, assembling well-trained detectives experienced in combating heinous crime, provided (with the aid of their agents) the accurate in-

4 See, e.g.: Konstantinov A. Tambov's benefit performance//Gangster's Petersburg-98 (1999). Olma-press, Moscow. P. ; also: Petersburg's wars. The new series //«Business man», the newspaper, 1999, October 21 № 193 (1837); and about 300 similar references in mass media.

5 See, e.g.: Korsunov P., Strelkovskaya A. The wreath with the words: "To the great patriarch of the underworld, Granddad Hassan..." especially stood out//«Business man», the newspaper, 2013, January 21, № 9/II (5040).P.1.

6 Dolgova & Dyakov, S.V. (1989). Organized crime. Moscow: Yuridicheskaya literatura, and later.

7 Principles of combating against the Organized Crime /edited by V.Ovchinskiy & al. (1996). Moscow, Infra-M, and later.

formation on the number, strength, structure and activity of organized criminal groups and associations, and also the intelligence analysts, who dealt with the generalizing of this information.

In 2004 Russian Federation joined the United Nations Convention against Transnational Organized Crime, and some years later, in 2009, the legal definition of organized criminal group has been edited for the purpose of bringing the domestic legislation into line with this Convention (Art.35 para.4, Russian Federation's Criminal Code). According to this new edition, the offence is considered as committed by the organized criminal association, if the accomplices assembled with the aim of committing one or more serious crimes in order to obtain, directly or indirectly, a financial or other material benefit. At the same time the law was supplemented with the aggravating circumstance – when this offence is committed by person who takes up the highest position in the criminal hierarchy, – such as “vor v zakone”, or “godfather”, punishable up to life sentence.

For more successful prosecuting the participants of the organized criminal activity, the rules of plea bargaining have been carried into effect in 2009, as a result of long and arduous debates (the opponents of that bill had been insisting that State power might not make a compromise with the criminals).

The list of above-mentioned legislative and managerial measures gives a good ground to state that up to nowadays there were the sufficient tools to combating against the organized crime in Russia. But the problem of spreading, more and more, the influence of organized crime to the economics, social and political life is still very serious, inspite of the Internal Office's Headquarters report about a fall in the organized crime. This fact, based upon the incorrect estimation of the menace of organized crime, was considered the reason of cutting down the police staff, specialized in combating against the organized crime, and the staff was diminished during the reformation of the police in 2010-2012, and more-over, Federal Anti-Organized Crime Department was abolished in 2008.

### THE PROBLEMS IN MEASURING OF ORGANIZED CRIME

According to the official data, in 2010 were recorded the number of the offences in Russia, committed by organized groups, 29,7% less than in previous year<sup>8</sup>. In 2011 the number of such offences reduced by 20,5%<sup>9</sup>. In all fairness, it is necessary to admit that in 2012 the number of offences, recorded as being committed by organized groups, increased for 2,4%<sup>10</sup>. Such statistical fluctuation can be explained with due regard for the bringing to light, by the Office of General Prosecutor in cooperation with the Federal Investigating Committee, the monstrous amount of offences, which were hidden for some years from the view of the Internal Office's Crime Registration Department. Although the impetuous falling down the quantity of the offences, committed by organized groups, shown in 2010 and 2011 by the Crime Registration Department, can be explained with nothing else but the conclusion about the official data's falsification.

In 2013 the official statistics again have shown the lowering of organized criminal activity (-4,3%), but the portion of the offences had been committed by organized criminal groups, in the amount of registered crimes kept on the same level (5,7%)<sup>11</sup>.

The heads of Internal Office and the Criminal Investigation Police report annually about thousands members of organized criminal groups and associations, and about at least half a thousand known gangs' leaders, opened up due to the police efforts<sup>12</sup>. Although only 1065 participants and leaders of the criminal associations had been accused and sentenced during last 10 years in the whole country, and it is not so impressive number as might be expected. And it should be noted that nobody had been convicted as a person of the highest position in the criminal hierarchy, in spite of the fact that the police disposes of the list of several hundred of persons who awarded the title of “vor v zakone”, and knows that most of them continue criminal activity.

8 See: Crime-Data 2010, Ministry of Internal Affairs of Russian Federation. Retrieved from <http://mvd.ru/Deljatelnost/statistics/reports/item/209732/>

9 See: Crime-Data 2011, Ministry of Internal Affairs of Russian Federation. Retrieved from <http://mvd.ru/Deljatelnost/statistics/reports/item/209743/>

10 See: Crime-Data 2012, Ministry of Internal Affairs of Russian Federation. Retrieved from <http://mvd.ru/Deljatelnost/statistics/reports/item/804701/>

11 See: Crime-Data 2013, Ministry of Internal Affairs of Russian Federation. Retrieved from <http://mvd.ru/Deljatelnost/statistics/reports/item/1609734/>

12 See: Falaleev M. Ministry of Internal Affairs Starts the Total Liquidation of Criminal Associations// Rossiyskaya Gazeta, 2007, February 9, № 4291. P.1.

And what is more, only 5 persons since 2009 have been convicted as the members of the gangs, used their official functions for the interests of criminal associations. Meanwhile the criminological research indicates convincingly that every criminal association cooperates with some corrupted civil servants or some specialists in IT, logistics, trade, shadowing, etc.

So, the police-recorded data does not show the appreciable rise of number of the offences, committed by the participants of organized criminal activity.

Measures of prosecuting	2009	2010	2011	2012
Number of registered offences	247	172	172	202
Number of convicted persons	164	190	232	203
Number of persons brought in a verdict of guilty for organizing a criminal association	39	52	73	57
Number of persons brought in a verdict of guilty for participation in an organized criminal association	120	138	159	146
Number of persons brought in a verdict of guilty for participation in an organized criminal association, using official functions	5	0	0	0
Number of persons of the highest position in the criminal hierarchy, brought in a verdict of guilty for organizing a criminal association	*	0	0	0

\*This aggravating circumstance is in use since 2009, November.

*Table 1. The dynamics of prosecuting of leaders and members of organized criminal associations, 2009-2012<sup>13</sup>*

But the results of criminological researches make the different picture: more than a half of enterprises and industrial works are under the control of organized crime, the representatives of organized criminal associations strike into the authority of the State, all over the country.

The Minister of Internal Affairs and the General Prosecutor of Russian Federation both admit that organized crime has already totally seized enterprises and works in fuel industries, “from oil wells and filling stations up to large-scale holdings”, in timber cutting and purchasing, in fishery<sup>14</sup>; and exerted extremely demoralizing influence on the police. It have already become a commonplace for the police – to take private enterprises under their “patronage” and get an illegal payment for that; police officials practise such a “patronage” upon everywhere, as well as bringing a powerful pressure to bear the illegal capture of enterprises to the benefit of organized criminal groups<sup>15</sup>. It makes clear that the majority of the police officials have no enough time to carry out their duties. Because of that it is not surprising that reported organized crime is less than 1% of its real figure.

<sup>13</sup> According to data of Ministry of Internal Affairs of Russian Federation, derived from [mvd.ru/upload/site1/import/65aff0dd0.pdf](http://mvd.ru/upload/site1/import/65aff0dd0.pdf) ; [mvd.ru/upload/site1/import/0e6b1bf0d3.pdf](http://mvd.ru/upload/site1/import/0e6b1bf0d3.pdf) ; [mvd.ru/upload/site1/import/c47a38e0d6.pdf](http://mvd.ru/upload/site1/import/c47a38e0d6.pdf) ; [mvd.ru/presscenter/statistics/reports](http://mvd.ru/presscenter/statistics/reports), [http://mvd.ru/upload/site1/document\\_file/vlXMMRlab8.pdf](http://mvd.ru/upload/site1/document_file/vlXMMRlab8.pdf) <http://www.cdep.ru/index>; [http://www.cdep.ru/userimages/sudebnaya\\_statistika/forma\\_10\\_1](http://www.cdep.ru/userimages/sudebnaya_statistika/forma_10_1). The full data of 2013 not yet published.

<sup>14</sup> Report of General Prosecutor of Russian Federation (2006) Y. Tchayka, Conference of the Heads of Law Enforcement Departments, (2006, November, 13). Retrieved from <http://genproc.gov.ru/genprokuror/appearances/document-11/>

<sup>15</sup> See: Falaleev M. Cleaning of the regiment. - Minister of Internal Affairs R.Nurgaliev's interview // Rossiyskaya Gazeta, 2008, October 14. № 4771. P.1.



On top of it, the experts of the General Prosecution Office' Academy add that not less than 1500 gangsters a year went unpunished<sup>16</sup>.

So, the problems of measuring of organised crime are following: the impossibility of the extortion of cases of organized criminal activity and participating in criminal associations out of the total amount of registration data; the distortion of the official registration data; and the shortage of specially trained detectives capable to get the intelligence data as well as analysts ready to generalizing the information.

It should be marked that other countries also experience some difficulties in gathering the accurate crime data, in research and analysis of it. General Secretary of UN noted in his paper delivered at the 12th UN Congress on Crime Prevention and Criminal Justice (2010), that they were going to revise the methods of survey in order to improve response rate, produce more timely data and minimize the reporting burden and complexity for Member States, in the following directions: developing a set of principles around international crime classification systems for statistical use; undertaking a case study for defining and classifying selected offences; and working with the European Commission on the current European Union-level classification project<sup>17</sup>.

### **THE MEASURES OF INCREASING THE EFFICIENCY OF ANALYSING OF ORGANIZED CRIME**

Of course, before the beginning of study the organized crime it is necessary to choose the optimal manner of study, so we are to define the object of study. The subject matter of organized crime is the specific criminal activity and individuals conducting it, which by itself, as in the case of crime in general, forms a system, as opposed to the types of crime that are traditionally marked out as special objects of study.

The criminologists of Europe and USA use to compare the organized crime with an enterprise, a kind of a syndicate (so-named "enterprise model"), or a kindred clan with some bureaucratic elements ("hierarchical model", like american Cosa Nostra). Very detailed essay of different theoretical models of organized crime, derived from a review of scientific literature in the United States, was given by K. von Lampe in his paper "The Use of Models in the Study of Organized Crime"<sup>18</sup>.

Many russian criminologists admit that organized crime is a phenomenon at least equal in complexity to crime proper<sup>19</sup> and call organized crime a complex system of organized crime formations, their relationships and activities<sup>20</sup>, and also a specific type of social pathology, which, as we may well agree, is a far more general concept than merely "specific type of crime"; they characterize it as a peculiar subject of economic relationships within a state<sup>21</sup> and point out high degree of cohesion and stability in vertical and horizontal connections both within the underworld and with meta-systems of state and society<sup>22</sup>. V.Ovchinsky, a well-known Russian expert on organized crime points out that it has some similarity with the network of social ties within society<sup>23</sup>.

This observation brings organized crime outside the common row of particular "types and forms of criminality" and sets it aside as very special phenomenon. Y. Gilinsky, warning against treating organized crime as a mere agglomeration of criminal organizations' activities, specifies

16 See: Theoretical Base of Research and Analysis of Latent Crime/ed. by Inshakov, S.M & al. (2011). Moscow, Uniti-Dana. P.347-348.

17 See: State of crime and criminal justice worldwide/ Report of the Secretary-General/Twelfth United Nations Congress on Crime Prevention and Criminal Justice (Salvador, Brazil, 12-19 April 2010).

18 Von Lampe, K. The Use of Models in the Study of Organised Crime (2011). – Liber Amicorum Petrus van Duyne. – Maklu. P. 291-306.

19 See: Pocamestov, A. Organized crime and its prevention // Criminology/ ed.by Malkov V. (2006). Moscow, Yusticinform. P. 402.

20 See: Criminology/ ed.by Dolgova, A. (2010). Moscow, Norma. P.549.

21 See: Kolesnikov, V. The criminological description and the prevention of economic crime (2007)// Criminology/ ed.by Khastorskiy G. – Sankt-Petersburg. P.346.

22 See: Kuznetsova, N. The Crime // Criminology/ ed.by Kuznetsova N., Luneev V. Ed.2 (2005). Moscow. P.94.

23 See.: Ovchinsky V. Organized Crime// Criminology/ ed.by Kudryavtsev V., Eminov V. Ed.3 (2006). Moscow, Yurist. P.357.

it as a qualitatively new characteristics of such state of crime when it becomes imbedded into a social system, exerting substantial influence on other elements of the system, economics and politics in the first place<sup>24</sup>.

So, taking into account some special national manifestations of organized crime, we rather take as its model a social system, or, which is more proper, anti-social system, because the hierarchy of criminal organization is very similar to the hierarchy of the state. The manifestations of organized crime imitate the main functions of state: racket is the analogue of tax collection, the dividing spheres of influence one may liken to an administrative division, etc. Criminal traditions play the role of justice, regulating the relations between members of criminal organization, between the leader of criminal organization and its participants, between the leaders of different criminal organizations, giving the opportunity of punishing those who breaks the traditions. The net of organized crime is a real tributary, with all attributes of its nature, but in negative sense, because organized crime is not interested in the development of the economic objects of which it derives the profit. The organized crime would exploit that objects till their total exhausting and throws them off, in order to pass on new objects. We must recognize that organized crime of nowadays is a real power, able to resist the legal state power, so the task of extraction the correct information about it is very difficult to carry out.

Organized crime, as it have already been mentioned, used to penetrate into politics, into state structures and camouflage itself under the mask of legality. So we'll fail to elicit the reliable data from official statistics, rather due to the malicious influence of organized crime to legal institutions. There are at least three ways of measuring and analysis of organized crime.

The most representative mode probably consists of collecting the intelligence data, obtained by the detectives and their agents; high reliability of this data proved by the fact that the data is got at first hand, from good authority. This kind of knowledge in generally is intended only for specialists, not for public.

The other way includes the interviewing of experts in the question of combating against organized crime, – detectives, investigators, prosecutors, judges – for getting their ideas about the real amount of crimes, portions of encroachments on different targets, areas of criminal influence. It seems that some kind of such information is possible to get only this way.

One more way of measuring and analysis of organized crime, which demands supreme efforts, numerous staff and adequate financing, is to conduct victimization survey, for getting the report about being or not a victim of organized crime from representative focus-group. And, of course, it is necessary to check the results of reseach, getting the information from another source.

And one cannot help mentioning about the content-analysis of publications in mass-media. Knowing rare-index of the Keywords – such as “organized crime”, “organized criminal activity”, “criminal group”, etc., one can detect how often these words are used in publications. The results of that analysis can show the degree of social anxiousness owing to the organized crime's existing. For example, be sure that every edition in Russia, printed or electronic, contents several publications about organized crime, and it shows an inauspicious situation.

So, what is the importance of getting the reliable knowledge about organized crime? A clear view at the probleme is the foundation of the adequate estimation the threat. We are to know the true scales of it, in order to be fully armed to resist it.

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<sup>24</sup> See: Gilinskiy, Y. Criminology: the Theory, the History, the Empiric Base, the Social Controlling. Ed.2. (2009).– Sankt-Petersburg, Yuridicheskij centr-Press. P.268.

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## FACTORS OF IMPORTANCE FOR PREVENTION OF PHYSICAL VIOLENCE AMONG HIGH SCHOOL STUDENTS<sup>1</sup>

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**Abstract:** On a sample of 488 students of Belgrade's high schools were analyzed potential risk factors of physical violence among students in order to enable productive prevention programs. Physical violence was measured by seven indicators: fights in school; fights outside the school; hitting, slapping, kicking another student in school; hitting, slapping, kicking another student outside of school; fights at school to defend the other; fights out side of school to defend the other; and starting a fight. Physical violence is expressed as a score on the first principal component of these indicators. A sample of personal characteristics was selected based on the settings of Eysenck personality theory and crime, and it consists of: extraversion / introversion, neuroticism and psychoticism. Social characteristics (23) were selected on the basis of different theoretical approaches, and were related to family, school and peer environment of students.

The data were analyzed using multiple regression analysis and showed that ten variables have a significant impact on physical violence. The coefficient of the significance indicates that of social characteristics are: gender of student, socio-pathological behavior in the family, frequently participating in sport activities during schooling, reprimand issued by school, students exposure to physical violence at school and especially outside of school, students exposure to threats at school and outside of school, and of personal characteristics are: extraversion and psychoticism. The resulting multiple correlation between the sample risk factors and physical violence is .834 which allows explaining 69 % of the variance of behavior.

**Keywords:** physical violence, personality characteristics, socio-pathological factors.

### INTRODUCTION

The perception of the importance of the study of aggression and aggressive behavior have changed in past years due to interest in the causes why some individuals compared to others express a greater number of aggressive responses in the same or similar situations, as well as due to increase in violence in recent decades in world and in our country. Tendency to justify some aggressive behavior of young people, particularly in the school environment and peer groups as playing, mischief and as transient, normal stages of development, can have immeasurable consequences if we bear in mind that the forms of aggressive behavior in children and adolescents acquire more and more serious and cruel manifestations. Manifestations can range from seemingly harmless youthful provocation and brawls, to serious physical conflict with the use of weapons, vandalism and extremely cruel and brutal behavior. These types of aggressive and deviant behavior at the micro level, can easily take all the hallmarks of the subculture of violence ( Milosavljević, Jugović, 2008). Consequently, aggressive episodes must be seen as a serious warning that, if ignored may be crucial for the further development of the entire life of a young person. Also, in the sciences that deal with behavior disorders there is more and more evidences that a serious criminal careers, particularly in multiple recidivists, starts at early ages. The famous Moffitt's thesis (Moffitt, 1993, 2002) on persistent and adolescence-limited behavioral disorders affected the definition of behavioral disorders in the DSM-IV, and is reason enough to devote full attention to those behaviors that manifest before adolescence and at early and later stages of adolescence, ie. during period of secondary education. There is strong and clear research evidence that disorders that begin early and that persist throughout the period of adolescence are associated with violent offenses (Moffitt et al. 1996).

<sup>1</sup> This work is the result of carrying out an internal research project of Police Academy, entitled *Violence in Serbia - causes, forms, consequences and social reaction*.

Realizing the seriousness and complexity of the phenomenon of violence, many researchers have devoted great attention to examining the factors that influence the occurrence and development of violent behavior, as well as the possibilities and ways of its prevention.

## THEORETICAL CONCEPTS

### The concept of physical violence among students

The literature cites a number of definitions of violence in general, and number of definitions specifically focused on definition of the concept of violence in the school environment. The World Health Organization defines violence as “the intentional use of physical or psychological force or power under the threat, against himself, another person, or against a group or community, that results in or is likely to result in injury, death, psychological harm, poor development or deprivation” (WHO, 2002). Farrington (Farrington, 1993) defines violence as a process that includes elements of physical, verbal or psychological attacks, or intimidation with intent to cause fear or harm to the victim. From the viewpoint of victims of a violent behavior, behavior can be defined as “any aggressive behavior that is seen by the victim as an act of abuse, or as damage, pain, distress and suffering (physical, mental, moral), and as forcing them to do what they do not like” (Trebješanin, 2008). In the opinion of Branislava Popović - Čitić (2007), violent behavior is behavior that is intentional and repetitive expression of physical or verbal forms of aggression with the purpose of causing physical injury, causing psychological pain and suffering, or exercise control and power over another person.

The author who has, without doubt, the most cited works on the subject of violence, especially violence in schools, is certainly Olweus (Olweus). He defines bullying as negative actions of one or more students directed at an individual (or group) that repeated several times, and specifies that bullying is a form of aggressive behavior in which there is repetitiveness and disparity of power (Olweus, 1993). What is important for defining the concept of peer violence in general is that the constituent elements of its definitions are deliberately taking adverse action, the repetition, with the obligatory presence of imbalance in strength (mental or physical). This definition could be criticized because of different reasons, where one of them is that according to this definition as the violence among students will not be considered if students have approximately equal strength, or if the student that is physically weaker causes injury or damage to the student that is physically stronger, but this is still the most commonly cited definition and at this point we will not deal with her deeper analysis.

Although at first glance it looks like it is not difficult to define “physical violence” among students, there are problems with its definition even in such limited and narrow sense. The classic definition of violence in this area is the one that gave Olweus (1999) and by which violence is “aggressive behavior where actor or perpetrator uses his body or an object, including weapons, to cause relatively serious injury or discomfort to another person”<sup>2</sup>. Thus, physical violence, unlike bullying can exist even if there are no repetitiveness and an imbalance of power.

In this paper, physical violence among students is defined as *the unauthorized, planned or impulsive infliction of damage to one or many students, by the second student or other students, where it is involved hitting and/or physical abuse*. This definition does not include already mentioned three elements - *intentionality, repetitiveness, and the imbalance of power*, because we believe that they are not necessarily the constituent parts of the definition of physical violence. In fact, there are a number of examples from everyday life where there is physical violence, although it is not long-term and repeated (one fight or hurting another student with an object), was not planned (behaviors that have the character of impulsive response), and there is no imbalance of power (students are about the same age, build and physical strength). Instead, there is an element of not a voluntary inflicted damage, meaning that the student, a victim of violence, did not agree to violence or damage regardless of whether or not his conduct gave reason and contributed to the violence.

<sup>2</sup> Quote by Popadić, D., Plut, D. (2007).



### **Basic assumptions and principles of developmental models of prevention**

Violent behavior is the result of a complex interaction of many factors. There are a number of factors that may increase the probability of occurrence, development and expression of aggressive behavior, and may increase susceptibility of youth to impact of various negative effects - risk factors. Under the risk factors are considered those factors in children and/or their surroundings, which increase the probability of youth involvement in negative or antisocial behavior (Bašić, 2009). These risk factors represent either individual, environmental factors, or characteristics that increase vulnerability to negative outcomes of the development process (Hawkins, Catalano, Miller, 1992). All risk factors of violent behavior can be divided into two basic major groups: factors with source in individual characteristics, and factors arising from environmental conditions and situations. Their identification, analysis of the area, and intensity of their action are prerequisite for defining effective plans and strategies of prevention, and for treatment of already manifested behavioral disorders. On elimination or mitigation of these risk factors are based many models of prevention of behavioral disorders, primarily so called developmental model of prevention (Žunić-Pavlović, Kovačević-Lepojević 2010; Popović-Čitić, 2010).

The basic premise of most developmental models of prevention is that the probability of occurrence of a behavior disorder or delinquency depends of the risk and protective factors, the interactions that exist among them, the number, type and intensity of risk and protective factors that participate in them, but that they depend also of the very nature of the interaction. Preventive actions are aligned to the nature of the interaction, the number of both factors, and depending of that preventive actions are intensified and expanded. In the practical application of the preventive procedures, their actors are responsible to primarily get familiar both group of factors, and then to study their interactions well because of these interactions depends the success of the implementation of the program. In addition, special attention must be paid to the nature and operation of protective factors since the process is often disguised and hard to find. Actors of prevention process should seek to eliminate the effect of risk factors, which is often nearly impossible, or to neutralize the effect of manipulation of protective factors (Catalano & Hawkins, 1996).

The concept of risk and protective factors, as a basis for most models of prevention that are now used in practice, is most evident in the "model of social development". Relying on empirical research Catalano and Hawkins (Catalano & Hawkins, 1996) specify the areas of activity from which the most risk factors are and consider that they may be conditionally classified into six groups: 1) individual factors, primarily the personality traits, 2) factors from the family environment, 3) factors that exist in the school environment, 4) peer groups and their impact, 5) factors that exist in the living environment or the local community, and 6) macrosocial factors whose range is very wide and includes cultural institutions, economic and political influence, and the like. Although may be put some objections to operationalization of these areas, it must be recognized that the proposed risk factors are a good source of variables whose impact on physical violence among high school students will be analyzed in this paper. It is logical, however, that within any work customized to requirements of the conference can not be analyzed all of these factors, and that within them must be made some selection. That selection is our sample of independent variables that will be discussed later. What is important at this point to say is that this selection was made with full respect of Eysenck's personality theory and his theory of crime. According to Eysenck (Eysenck, 1977) criminal behavior develops as a result of multivariate interactions between environmental conditions and the inherited characteristics of the nervous system. Eysenck's insistence on the inherited characteristics of the nervous system does not define stand on the innateness of crime, but the legality evidenced by research that the features of this system influence the personality characteristics, and ways of responding to stimuli from the social environment. In his research Eysenck identifies the central and autonomic nervous system as important sources of learning socially unacceptable rules of behavior, and reactivity processes (inhibition and excitation) and sensitivity as directly responsible for that learning. In addition to these processes, an important source of learning these unacceptable rules is socialization process, or more precisely mistakes made in this process by members of family, school, peer groups, cultural institutions and others.



## PROBLEM AND CASE STUDIES

There is no doubt that the physical abuse of students is one of the important phenomenon that requires systematic monitoring and research. Because of the seriousness and severity of the consequences that physical violence can have not only on the individual but also on the broader social level, physical violence among students requires the engagement of all the resources of society and the establishment of a comprehensive systematic solutions. Necessary precondition for the creation of such solutions are scientifically based research and prevention programs based on those research. In other words, it is necessary reliably to detect which individual and social factors increase the likelihood of physical violence among students. The problem of this study are precisely those factors in the area of social and personality, that create conditions or directly affect the occurrence of this type of behavior. Starting from the basic tenets of Eysenck personality theory and the theory of crime (Eysenck, 1970, 1977, 1983, 1989) for an analysis of risk factors for physical violence were selected personality traits that Eysenck cites as important determinants of criminal behavior, as well as some adverse socialization effects in the field of family, schools, and peer groups. Accordingly, the subject of this paper can be defined as determining the nature of the relationship between extraversion-introversion, neuroticism and psychoticism, and a large number of variables in the area of family, school and peer groups on the one hand, and physical violence on the other.

What are the specific variable in question, it is noticeable from their names given during the presentation of the results.

## METHODOLOGICAL SOLUTIONS

### Dependent Variable

The dependent variable is physical violence, defined as the unauthorized, planned or impulsive damage to one or more students by other student or students by hitting and physical abuse. Indicators for trial of physical violence defined in this way were: 1) Fights in school, 2) Fights outside of school, 3) Hitting, slapping, kicking another student in school, 4) Hitting, slapping, kicking another student outside of school, 5) Fights in school in order to defend the other, 6) Fights outside of school in order to defend the other, and 7) Starting a fight.

### Independent Variables

Independent variables were selected from four areas<sup>3</sup>: 1) In the field of personality characteristics (extraversion-introversion, neuroticism and psychoticism), 2) In the field of family relationships, 3) The area of the school environment, 4) In the field of peer groups and peer influence.

### The sample

Analysis of risk factors of physical violence was done on a sample of 488 high school students in Belgrade. Schools in which the test is conducted, in total four schools, were selected based on readiness of their management and technical teams to collaborate in this study. The selected schools are, therefore, a deliberate pattern of Belgrade schools. This method of selection was allowed, since the survey was not intended to provide a picture of the prevalence of physical violence throughout Belgrade, but to determine the relationship between the conduct and the supposed risk factors. The choice of classes within schools, as well as the selection of students was, however, completely random. The survey was conducted in three schools of technical professionals and one gymnasium.

### Instruments and data collection

Testing of students is done with the two instruments. As first, the test of personality traits (EPQ-R) (Eysenck, S.B.G, Eysenck, H.J, Barrett, P., 1985), or more precisely its version of EPQ-103, which is standardized for the Serbia (Šipka, 1988, 1992). Reliability of each subscale of the test is above 0.84, which means that they have a sufficient, but not a high reliability. As second, the Questionnaire about students' behavior, which is specifically designed for research

<sup>3</sup> Due to limited space definition of each independent variable will not be. It seems that this is not necessary since they are commonly known, or clearly identifiable dimensions based on their name.

purposes. Except personality characteristics, with this Questionnaire were tested all the other variables. Questions in the Questionnaire were the proposed responses scaled from 1 to 5 for all the interval variables (except “participating in sports” and “corporal punishment of students in the family”, which are scaled from 1 to 3). Categorical variables were binary coded. A higher score on interval variables, regardless of whether they are coded from 1 to 5, or from 1 to 3, marked undesirable social behavior or condition.

#### Data processing and analysis

Initial data processing was performed through traditional descriptive methods (calculation of frequency, percentage, arithmetic mean, etc.). As dependent variables was used the component “Physical abuse of students” with the goal to determine the relation between personality traits, and testing which of these dimension in the field of family relationships, school environment and peer groups are the risk factors of physical violence. This component is as dependent variables included in the multiple regression analysis method. In which way is obtained this common component, it is clear later in the text of this study.

## RESULTS AND DISCUSSION

#### The frequency of physical violence

We begin analysis of the relationship of physical violence with selected socio-psychological characteristics with distribution of responses by students from the sample of this study of physical violence. Data is presented in the following two tables.

Answers	In school		Outside of school	
	%	N	%	N
Never	228	47.6	182	38.1
Once	79	16.5	75	15.7
Twice	44	9.2	40	8.4
Three times	25	5.2	14	2.9
Many times	103	21.5	167	34.9
Total	479	100.0	478	100.0

Table 1. Young people sometimes get into a fight. Did this happen to you.

Answers	In school		Outside of school	
	%	N	%	N
Never	213	44.6	165	34.6
Once	86	18.0	82	17.2
Twice	28	5.9	38	8.0
Three times	18	3.8	19	4.0
Many times	133	27.8	173	36.3
Total	478	100.0	477	100.0

Table 2. Have you ever slapped, kicked, punched someone, or similar, because you were nervous or provoked

Before beginning this study, we could not imagine that physical violence in school and outside of school is to that extent. It really is absolutely incredible from the standpoint of pedagogy, psychology, as well as all other educational professions, more than half of tested samples of students participated in fights at school or even in a larger scale, outside of school (data in Tables 1 and 2). What’s worse is that the level of participation was raised to a high level, so that between one-fifth and one-third of students have three or more fights or acts of physical violence manifested as slapping, kicking, hitting, or the like.

**Physical violence and gender of student**

Answers	In school				Outside of school				
	female		male		female		male		
	N	%	N	%	N	%	N	%	
Never	117	76.0	111	34.5	101	64.7	81	25.2	
Once	21	13.6	58	17.8	28	17.9	47	14.6	
Twice	7	4.5	37	11.3	9	5.8	31	9.6	
Three times	2	1.4	23	7.0	2	1.3	12	3.7	
Many times	7	4.5	96	29.4	16	10.3	151	46.9	
Total	154	100.0	325	100.0	156	100.0	322	100.0	
S=.382; p=.000				C=.395; p=.000					

*Table 3. Gender and physical violence*

The data in the table confirm the expectation that in the physical violence of students primarily participate young men. When the participation in fights is concerned, three times more boys than girls participate in these fights, and even seven times more than girls that have a high degree of participation (29.4% of males versus 4.5% of girls participated in more than three fights). When this type of violence was outside of school these differences are somewhat mitigated, but the overall incidence is still very high - the half of male students had three or more physical assaults of this kind on other people while outside the school. No matter that the volume of physical violence between boys and girls is significantly different in favor of the boys, but the extent of violence among girls and the fact that one-quarter to one-third of girls also participate in fights at school (24%) or outside (35.3%) is quite unexpected.

The differences in the extent of violence among boys and girls can best be seen in Table 4, which is reduced at two categories from the Table 3: 1) no participation in fights and 2) is involved in the fights.

Answers	In school				Outside of school			
	female		male		female		male	
	N	%	N	%	N	%	N	%
Never participated in fights	117	76.0	111	34.5	101	64.7	81	25.2
Participated in fights	37	24.0	214	65.5	55	35.3	241	74.8
Ukupno	154	100.0	325	100.0	156	100.0	322	100.0

*Table 4. Gender and physical violence*

It's only obvious right situation about participation in fights in and outside of school, when gender is taken into account.

The data indicate that in physical violence participates between 65.5% (in school) and 74.8% (out of school) male students, and between 24.0% (in school) and 35.3% (out of school) female

students, and that both men and women in our sample more likely participate in fights outside of school than in school. The difference is in case of both genders around 10%, in the direction of participation in fights outside the school. The result is quite alarming and requires urgent intervention of skilled people in the country, the immediate change of the program, a serious analysis of the quality and skills of teachers in schools, but the urgency of it all is a study of the reasons why this is so.

### **The influence of personality traits and microsocial factors on physical violence**

When it comes to the analysis of the association of physical violence with personality traits and variables in the areas of family, school and peer group, it is necessary to draw attention to two details. As already stated in the relevant section, physical abuse of students was tested with seven questions. Each of these questions due to different definition of situations in which violence is examined is a separate variable. The existence of seven variables related to physical violence increases the reliability of data on violence, but also causes some difficulties because it requires a separate analysis of each variable. As this type of analysis is beyond the scope and purpose of this work it was necessarily to reduce those seven variables to a common measure. The best way to reduce them to common measure is the procedure of factor analysis, where is calculated the first principal component from the seven individual indicators of physical violence. From Table 5, it is evident that the reduction of seven variables of physical violence to one component is justified because it was obtained nearly ideally defined common dimension whose meaning is "physical abuse of students". This conclusion follows from the high correlation of each variable of physical violence with this common component, but also from the clear structure of the common component.

Variables	R	h <sup>2</sup>
Fights in school	.755	.571
Fights outside of school	.809	.655
Hitting, slapping, kicking students in school	.762	.581
Hitting, slapping, kicking other outside of school	.760	.580
Fight in school to protect other	.759	.576
Fight outside of school to protect other	.800	.640
Initiated the fight	.716	.513
Statistical parameters: $\lambda=4.117$ ; % variance 58,81;		

*Table 5. Structure of first main component of variables of physical violence<sup>4</sup>*

Another important detail is that the answers of the respondents to the individual variables were converted, through statistical procedure, into the results of the factor. These results are for the purposes of this analysis presented in three categories: no physical violence, physical violence is rare, and often physical violence. Correlation thus obtained categories of physical violence with personality traits and socio-psychological characteristics of the micro-social environment were tested using multiple regression analysis. The results obtained are presented in Table 6.

<sup>4</sup> R is a linear relationship between the variables with the first principal component, h<sup>2</sup> represents communality of variables

Variables	Dependent variable: physical violence among students			
	R	Rp	B	p
Extraversion	.148	.157	.099	.001
Neuroticism	.004	-.016	-.011	.742
Psychoticism	.426	.184	.134	.000
Gender of respondent	.476	.174	.128	.000
Success in school	.236	-.040	-.026	.409
Family relationships according to respondent	.121	-.004	-.002	.940
Physical punishment of respondent	.158	.036	.022	.463
Socio-pathological behavior in the family	.084	-.105	-.065	.029
Crime in the peer group	.282	.067	.044	.168
Playing sports during schooling	-.210	-.141	-.088	.003
Attentiveness during school classes	.283	.060	.042	.218
Regularity in learning	.254	-.008	-.006	.875
Regularity in doing homework	.291	.064	.052	.182
Fleeting from home	.284	.032	.021	.508
Decreased success in learning	.215	-.001	.000	.988
Socio-pathological behavior in the peer group	.296	.000	.000	.999
Social victimization	.263	-.002	-.004	.972
Psychological victimization 1 (mocking)	.230	.001	.001	.985
Individual is a victim of physical violence in school	.537	.219	.172	.000

Individual is a victim of physical violence outside school	.680	.315	.267	.000
Psychological victimization 2 (threats at school)	.549	.151	.120	.002
Psychological victimization 3 (threats outside of school)	.637	.199	.161	.000
Changing schools because of conduct	.192	-.015	-.010	.756
Punishment in the school reprimand	.493	.217	.157	.000
Crime in the family (growing up)	.146	.001	.001	.978
Propensity to cheat in school work (copying domestic)	.131	-.004	-.002	.939
Multiple correlation/Rm=.834 Rm <sup>2</sup> =.695				

*Tale 6. The influence of personality traits and socio-psychological factors of microenvironment physical violence<sup>56</sup>*

Regression of 26 variables, of which three personality traits and 23 variables from micro-social environment, on physical violence among students gave a very interesting and important results. It is, above all, an extremely high multiple correlation (Rm) of .834, between these 26 variables and factors of physical violence among students. High correlation tells us that this violence, defined with our variables or better said with factors obtained from these variables, can be explained in 69.5% with these 26 variables, which is undoubtedly a valuable result. Of course, to this level of explanations of physical violence among students do not contribute all variables equally, and some do not contribute at all.

With a review of the results in the table, it can be noted that many variables do not have a significant role in causing physical violence among students. This is true even for some variables that were believed to be important etiological factors of violence. In contrast, some that did not look important are becoming such. Thus, among the variables that can be removed from the list of important factors of physical violence among students are: success in school, family relations with juvenile member, corporal punishment of minors, crime in the peer group, attentiveness in class, regular learning and homework, running away from home, a drop of success in learning, socio-pathological behavior in the peer group, social victimization manifested by avoiding socializing with students, psychological victimization manifested with ridicule, insults, and the like, changing schools for conduct, criminal violence and the tendency of students cheating in school work. This set of 15 variables that do not have a significant role in physical violence among students for us is especially important because prevention programs that would be based on them would be certainly doomed to failure.

<sup>5</sup> The meanings of the symbols in the table are as follows: R is a linear correlation, Rp partial correlation,  $\beta$  partial regression coefficient, P is the significance level. Rm is the multiple correlation of all variables with physical violence among students, and Rm<sup>2</sup> squared multiple correlations or percentage explanations of physical abuse of students with 26 variables (if divided by 100).



If we bear in mind that from 23 variables, 15 variables mentioned above have no effect on physical violence among students, the question arises as to which variables and with which power affect the violence so that they succeed to explain 69% of the violence, and to achieve multiple correlation of .834. Based on the review of the coefficient of significance ( $p$ ) one can conclude that those variables are: gender of student, socio-pathological behavior in the family, training some sport during schooling, punishment with reprimand by school, exposure of students to physical violence at school and especially outside of school, students exposure to threats in school and outside of school, and of course, personality characteristics, but not all of them. In other words, based on these results, it can be said that physical violence is executed by boys, those students who have family members who have problems with alcohol, drugs, gambling, etc., and students who participate in sports, who are victims of physical and psychological violence in school and out school and are punished by reprimand.

One of the interesting results is the status of variable "training sports during schooling". It turned out that training of sports truly affects the physical violence, but in a direction that was a little unexpected - in the direction of increasing the likelihood of violence. In other words, playing sports is a factor of physical violence, and not a preventive factor. Judging by the results, it seems that the time has come to abandon the stereotype that training sports, or at least some types of sports, is a prevention to behaviors such as crime and physical violence.

As for the three personality characteristics, analysis results show that extraversion is, not so strong, but significantly associated with physical violence among students when it comes to linear correlation (.148), and in the case of partial correlation (.157). This correlation indicates that the extravert students often behave violently. The connection is immediate and does not change under the influence of intervening variables (.148, .157). However, extraversion has no power of prediction of violence ( $\beta = .099$ ). Neuroticism is completely "irrelevant" feature when it comes to violence and has no role in predicting violence.

Unlike the previous two personality characteristics, psychosis is a pretty powerful factor of physical violence among students, with a significant role in the prediction of violence. Direction of correlation shows that the violence will be more parallel with the increase in the level of psychoticism and that students who often behave violently have high scores on tests for psychoticism.

## CONCLUSION

Physical violence in the population of high school students is an important phenomenon that requires systematic monitoring and research. Because of the seriousness and severity of the consequences that may be it is necessary to create an effective system of social response on such violence, which must be based on scientific research and prevention programs based on that research. This work aimed to identify a number of important risk factors, which should be taken into account during programming and implementation of preventive activities for this behavior.

"Physical violence among students" was defined as unauthorized, planned or impulsive damage to one or more students by other student or students through hitting and physical abuse, and it was tested with seven variables. The study of so defined physical violence on a sample of 488 high school students in Belgrade led to the data that in fights, as the worst form of violence in our sample of students, participated even 65.5% of male students and 24.0% female students, and that participation in fights outside of school is more frequent than inside of school, and that there are serious indications that the violence in the streets gradually enters into the school environment;

Regarding the risk factors, most influence on physical violence have gender of students, socio-pathological behavior in the family, doing some sport during schooling, punishing reprimand issued by school, students exposure to physical and psychological violence in schools and especially outside of school, and of course, personality traits, but not all.

Personality characteristics have a different status related to physical violence. To violence contribute psychosis and extraversion, while neuroticism is without any impact on physical violence. Psychosis is quite strong factor of physical violence among students and its impact is of

such quality and intensity that allows the prediction of violence. Extraversion was significantly associated with physical abuse of students, but there is no predictive ability of this behavior. Neuroticism is completely independent of all these behavioral disorders.

Another important general conclusion is that with the help of extraversion, psychoticism and those socio-psychological characteristics that have a direct connection with these disorders, these disorders can be explained to a considerable extent of 69% (multiple correlation = .834), which is certainly an important result, because it allow us to forecast these disorders with small number of variables, and timely to program preventive action in order to prevent their full development.

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## DOMESTIC VIOLENCE - STUDIES AND STATISTICAL PRACTICE IN SERBIA<sup>1</sup>

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**Abstract:** The purpose of this paper is to present the current situation in relation to the monitoring and recording of domestic violence by some government entities in the Republic of Serbia, with a critical review by certain shortcomings in this field of work. Domestic violence is a problem which was treated by certain social institutions in the Republic of Serbia, and, scientifically, from different theoretical approaches. Statistics on the state and city level (Belgrade) shows by incidence of domestic violence, that domestic violence is widespread phenomenon and has growing frequency, and that women and children are most often the victims. However, follow-up events and statistics are not adequately systematized and not gender sensitive. Also, there is no unique database at the national level in which domestic violence would be fully documented by the standardized methodology. A review of research conducted by us as well as current statistics of some state agencies (Ministry of Internal Affairs, National Bureau of Statistics of the Republic of Serbia, Center for Social Work) suggest there is a lack of gender statistics, the lack of information that could be included in the statistics and lack in documenting the occurrence of domestic violence in our country.

**Keywords:** domestic violence, gender-based violence, statistics of domestic violence, evidence of domestic violence, Serbia.

### INTRODUCTION

Domestic violence is extremely harmful and widespread social phenomenon with enough indicators that shows us this is dangerous family event, with big and heavy consequences, durable, cruel violence broadest scale, which in the vast area remains unknown, even in cases of severe outcomes. Foreign authors noted that there are difficulties in measuring the extent and nature of domestic violence due to many reasons.<sup>2</sup> They note that statistics on domestic violence led by some government agencies such as police and the prosecution, is not complete, and that research (ie surveys and interviews) better reflects the current state of the incidence and prevalence of domestic violence. This is because the victims of domestic violence much less signed up their experience to relevant authorities due to the belief that it is not a matter for police involvement, or that their experience is too trivial, or out of fear of reprisals from the abuser. Therefore, there is a significant number of incidents of domestic violence that victims do not report. In the UK, data on domestic violence has only recently started to be collected by the criminal justice system, which is only the tip of the iceberg. Unlike other crimes, it is often difficult to separate the overall occurrence of domestic violence from individual incidents. Specifically, the incidence of domestic violence are likely to be far lower than the prevalence of domestic violence (due to repeated victimization). Abuse may be continuous (eg victims live

<sup>1</sup> This paper is the result of the research on the following projects: "Transition And Economic Crime", „Status And Role Of The Police In A Democratic State“, and „Violence In Serbia – Causes, Forms, Consequences And Social Response“ which is financed by the Academy of Criminalistic and Police Studies.

<sup>2</sup> British Crime Survey, Report of Thompson, G. 2010.

under constant threat), or violence may become more frequent so that the victims can every time turn to for help. Even if it were possible to officially record the individual acts of domestic violence, and so that the rate of domestic violence, it would not be a reliable indicator of the number of possible victims and the risk of exposed persons. Any statistics that describes the level of violence must be taken with caution.<sup>3</sup>

In Serbia, in the last ten years was done a significant shift in state policy toward domestic violence: the adoption of amendments to the Criminal Code in June 2002. where domestic violence is finally provided as a separate offense. In 2007. Government founded the Sector for Gender Equality within Ministry of Labour and Social Affairs, 2008. the sector has grown in the Gender Equality Department, and in 2011. Republic of Serbia has drafted and adopted first national strategic documents in the field of combat and prevention of violence against women - National Strategy for Prevention and Combating Violence Against Women in the Family and in Intimate Partner Relationships<sup>4</sup>, and Overall Treatment Protocol On Cooperation Between Institutions And Organizations In The Fight Against Violence On Women. Ministry of Labour and Social Affairs, Ministry of Interior, Ministry of Health and Ministry of Education, Science and Technological Development have developed and adopted specific protocols for the treatment of professional staff who works in the state institutions in the fight against domestic violence. The General Protocol On Procedures And Cooperation Of Institutions, Agencies And Organizations In Situations Of Violence Against Women In The Family And Intimate Relationships are ordered to each institution that receives the information on the violence in the family and information about the relevant circumstances. However, monitoring, documentation and statistical data by the state institutions (Ministry of Labour, Employment and Social Affairs, the Ministry of the Interior, National Bureau of Statistics) are not adequately accommodated in order to give us complete picture of domestic violence, because each of these institution has its own methodology for data collection and processing. In order to obtain an overall picture of domestic violence in Serbia, it is necessary to build a unified statistics that will primarily be gender sensitive (data should be collected and recorded by all dimensions and by gender). Domestic violence, *inter alia*, gender-based violence, and as such, should be documented by the responsible institutions in specific gender categories.

In our work in the first chapter, entitled Domestic Violence, Definition and Dimensions, we present some definitions of domestic violence taken from foreign literature, then we provides the current definition in domestic legislation. In the chapter titled Studies of Domestic Violence in Serbia, we have presented and gave a brief description of the research that has been conducted in Serbia, with some data from them. In the chapter titled Monitoring on Domestic Violence in the State Institutions of the RS, we tried to take a critical look at the current situation in the field of monitoring and recording domestic violence by local government institutions, and we modestly suggest possible solutions, in order to improve conditions in this area. In Conclusion, we briefly summarize the situation in the field of documenting domestic violence in Serbia and we express the view that statistical data should definitely be improved.

## DOMESTIC VIOLENCE – DEFINITION AND DIMENSIONS

According to the definition contained in the Convention of the Council of Europe Convention on preventing and combating domestic violence (adopted in May 2011. In Istanbul<sup>5</sup>), domestic violence is any act of physical, sexual, psychological and economic violence occurring in the family or household or any partnership, or an intimate relationship, whether or not the perpetrator shares or does not share the same residence with the victim. Domestic violence is a form of victimization and a demonstration of control and power over the victims that leads to loss of confidence, and it is a threat<sup>6</sup>. With regard to victims of domestic violence are mostly

<sup>3</sup> Thompson, G. 2010.

<sup>4</sup> Sl. glasnik RS, broj 027/11.

<sup>5</sup> <http://www.gendernet.rs/files/Publikacije>

<sup>6</sup> Čopić, 2004



the women (more than 80% of cases, according to international statistics), domestic violence is usually considered as violence against women and gender-based violence.

Gender-based violence is reproduction of imbalanced power relations between men and women who have been conditioned by their unequal position in the social structure and cultural system of values, and includes stalking, sexual violence, trafficking of women and domestic violence.<sup>7</sup>

Gender-based violence in the family is not an isolated, sporadic or excess forms of family conflict, but rather stems from systematic gender inequalities and established simultaneously in the sphere of public and private life. The literature on domestic violence is often interchangeably used terms such as violence, abuse, neglect, and so on. Approval of a very precise meaning of these terms and their use does not exist. Some authors suggest that the difference between violence and abuse is manifested primarily in the fact that the abuse involves more systematic harmful behavior which seeks to establish control over the person against whom it is done. It is a system of relations of domination and control, while violence may represent a eruptive, temperamentally, uncontrolled reactions, which do not contain this background of control and domination. However, in most of the studies these two terms means establishing and maintaining domination and control of the perpetrator over the victim.<sup>8</sup>

Today, the prevailing notion that domestic violence is a crime, and the fact that it is played at home does not diminish the social danger of the crime phenomenon and families where there is violence can not be protected by domain privacy.<sup>9</sup> Until the beginning of the 70s of the last century, domestic violence has remained “behind closed doors” and was considered to be part of intimate family relationships. Shares of the women’s movement in the seventies, together with the development of representation and advocacy for the rights of victims of domestic violence, were the basis for the change in approach to domestic violence. Women’s groups have lobbied for the introduction of criminal law to protect victims of domestic violence and equal or more stringent approach to perpetrators of domestic violence than to violence outside of the family.

Violence perpetrated by family members differs from the violence outside of the family. Domestic violence is an abuse of power and control over those family members who have less power and have less resources. In most societies, especially in the traditional and patriarchal communities, men have significantly more power - not only physical, but also economic and social.

In recent years, Serbia has made a great effort and made significant progress to improve the protection of victims of sexual and gender-based violence. The legal framework has been improved through Family<sup>10</sup> and Criminal Law,<sup>11</sup> and the adoption of framework laws such as the Law on Gender Equality<sup>12</sup> and Anti-Discrimination Act,<sup>13</sup> and the National Strategy for the empowerment of women and promotion of gender equality.<sup>14</sup> The definition of gender-based violence is given in the Law on Gender Equality (2009). It is defined as “conduct which endangers the physical integrity, mental health or peace, or material injury to the face, as well as a serious threat of such behavior, which prevents or restricts a person to enjoy rights and freedoms on the principle of gender equality” (Art. 10, pa. 1, t. 5). In Domestic Law, according to the Family Law, domestic violence is “behavior of a family member threatens the physical integrity, mental health or peace of other family members” (Art. 197, paragraph 1). Circle of persons that provide protection from domestic violence is broad and goes beyond the classical definition of family. Thus, for the purposes of achieving protection against domestic violence, family members, within the meaning of the Family Law, are spouses or ex-spouses, children, parents and other blood relatives, persons in-law and adoptive relatives, or persons associated with foster care persons live or have lived in the same household, unmarried partner or former common-law partners, persons who are a former or current emotional or sexual relationship, or who have a common child, or a child about to be born, even though they have never lived in the same household.<sup>15</sup>

7 Babović i dr., 2010: 33

8 Hampton, 1999.

9 Konstantinović-Vilić, Petrušić, 2005

10 Sl. Glasnik RS, broj 18/05.

11 Sl. Glasnik RS, broj 85/05.

12 Sl. Glasnik RS, broj 104/09.

13 Sl. Glasnik RS, broj 22/09.

14 Sl. Glasnik RS, broj 15/09.

15 Acordind to: National Strategy for the Empowerment of Women and Promotion of Gender Equality, 2011.



The Criminal Law defines the crime of domestic violence carried out by anyone who acts of violence, threats to attack the life or body, insolent or arrogant behavior jeopardizes peace of mind, physical or mental condition of a member of his family. A family member in the Criminal Law defines rape in relation to family law, which reduces the possibility of criminal protection of victims in all cases of domestic violence. The Criminal Law provides that the following family members: spouses, their children, spouses ancestors lineal kinship, common-law partners and their children, adoptive parents and the adopted child and foster family, and brothers and sisters, their spouses, former spouses and their children and parents of former spouse, if living in the same household as the persons who have a common child, or a child about to be born are considered family members, even though they have never lived in the same household.

Criminal Law and criminological definitions of violence identified only as physical violence and / or threat of physical violence. However, as the constant practice of domestic violence is all the other types of coercion (threats, coercion and/or use of force) that aim to control the behavior of the victim, establishing power over her, or abuse her trust.<sup>16</sup> Partner violence includes various forms and manifestations, some of which are physical, psychological and sexual violence recognized in law as a criminal offense and as such are sanctioned. Psychological violence is the most common companion announcement or physical violence, typically achieved through the threat of bodily harm, and interpreted by the criminal definition - it is a qualified threats. Although domestic violence is often linked with emotional abuse (victims, especially children, suffer because of emotional blackmail and threats) it is not included in criminal definition of domestic violence. For this reason, it is important to keep in mind all aspects of oppressing behavior and the possibility of other crimes, otherwise the social/preventive care may not be complete and adequate, and the reaction of the prosecution – effective.<sup>17</sup>

### SURVEY OF DOMESTIC VIOLENCE IN SERBIA

The first comprehensive study on domestic violence in Serbia was conducted in 2001. The Victimology Society of Serbia on a sample of 700 adult women from urban and rural areas in the territory of seven cities (Belgrade, Subotica, Novi Sad, Vrnjačka Banja, Zaječar, Užice and Niš) and around 40 villages in the Republic of Serbia (Kosovo and Metohija). It showed that one in three said it was the victim of some form of physical (30.6 %), and nearly every other (46.1 %) some form of psychological violence (degradation, humiliation, mental and emotional exhaustion, denial movement and the use of money, threats, blackmail, intimidation, use of privilege where women are subordinated, etc.). In this study was registered that every fourth woman threatened with violence (26.3 %), and in 7.4 % of cases the violence has involved the use of tools or weapons, while 8.7 % of women said they had been sexually abused. It turned out that the perpetrator usually is a husband or partner. An important finding of this study is that the rates of reporting violence to the competent authorities and services were low. Among the women who are survivors, a small number reported last violent incident to the police (17 %), social work services (10 %), and health care institutions (15 %), and 4% of cases of violence had in court. Reasons for not reporting violence were different. For example, the reasons for which violence is not reported to the police were, in order of frequency, the following: a) victims felt that the last violent incident was not serious to the extent that would require police intervention, b) there were a disgrace c) feared the escalation of violence, d) did not have confidence that the police can help, e) had previous experience that the police do not want to get involved in domestic violence. Of the total number of women who have experienced violence, 2% reported last violent incident to some of state services.

Another important study was supported by the World Health Organization, and carried out by non-governmental organizations (NGOs) in the 2003. The research was conducted within the Crosscultural Studies on Women's Health and Violence Against Women,<sup>18</sup> which was designed and implemented by the WHO, the standard methodology in ten countries on a total sample of more than 24,000 women. In Serbia, the study included 1,456 women (aged 15 - 49 years) living in 11 municipalities of the city of Belgrade. The objectives of the study were: to provide reliable estimates of the incidence of physical, sexual and psychological violence against women,

<sup>16</sup> Lukić, Jovanović, 2002.

<sup>17</sup> Lukić, Jovanović, 2002.

<sup>18</sup> The Multicountry Study on Women's Health and Domestic Violence against Women, 2005.

to assess the link between partner violence and its health consequences, identify factors that may protect or endanger a woman, as well as strategies and services that are used to protect of violence. The study provides a basis for understanding the types of assistance used by the respondents who have experienced violence. According to the survey, 27 % of women reported physical violence to any service, 53 % confided to friends, 28% to parents and 26% to relatives. 78% of physically abused women had not sought the assistance of competent bodies and services. Police approached to the 12.6 %, 9.6%, health care facilities, and 8.9% sought help in the social services. Also, studies have shown that the low rate of addressing to health and social work services, as well as a low rate of seeking help from the police and NGOs, may be explain by the lack of trust in these institutions, the lack of information about legal rights, lack of adequate laws and legal regulations, non-application of the law and the slow process protections at all levels, and the relative “invisibility” of the NGO sector - as a new form of support in the Serbian scene.

According to the latest survey on domestic violence against women by the Victimology Society of Serbia conducted in Vojvodina in 2010, the rates of reporting violence to the competent authorities and agencies indicate that victims rarely turn to relevant authorities and agencies, and those who have decided to take this step, is often not satisfied with the interventions. Police help sought by 23 % of all the victims, while to CSWs approached 18 % of victims and 30 % asked for help in health care due to injuries (mostly due to fractures and dislocations). Court proceedings was in 10% of cases conducted against the perpetrator (mainly was pronounced fine), and in 5 % of cases have been imposed protective measures against domestic violence under the Family Law.<sup>19</sup> The study also pointed out that women are still under-informed of their legal rights: 38 % do not know that domestic violence is a crime. Most women (61 %) know that there are safeguards against violence on Family Law, but their knowledge is on an abstract level (they heard of the possibility, but they do not know what specific measures are available).

Mapping of Domestic Violence Against Women is a study based on research by the organization SeConS - group development initiative implemented under the project Fight Against Sexual and Gender-based Violence. The survey was conducted on the territory of Central Serbia in the period of 2010. Starting with the project goals and recommendations of the CEDAW Committee, defined the following key objectives was: mapping domestic violence against women and the prevalence of different forms of domestic violence against women; determining characteristics of domestic violence against women to important aspects; investigation of the effects of family context and the various factors on the expression of violence against women; Testing access to social support services to victims of domestic violence.

In this way the research should contribute to the achievement of individual objectives of the national strategy for improving the status of women and promoting gender equality, which is conducting research and improving documentation and statistics. This research has made a significant contribution to raising awareness about the prevalence, structure and characteristics of domestic violence. What is important to emphasize, and what the data cited in studies of domestic violence against adult women was a huge gap between the registered rate of violence and the level of reporting violence.

## **MONITORING OF DOMESTIC VIOLENCE IN SERBIAN STATE INSTITUTIONS**

In Serbia, there is no systematic monitoring of the situation in relation to domestic violence, or its unique database.<sup>20</sup> Valuable insights into the issues of violence against women are descended from women’s organizations that provide various forms of support to women experiencing violence, but these insights remained limited to that women who sought help, which accounted to a small number of victims of domestic violence. The official statistical records of the National Bureau of Statistics are also incomplete because the data are based on the records of the Ministry of Interior and Ministry of Justice, which is why statistics is again reduced to the cases that were subject to police intervention and who entered the justice system.

<sup>19</sup> Sl. Glasnik RS, broj 18/05.

<sup>20</sup> Simeunović-Patić, 2012 :89

State institutions do not adequately monitor the extent and frequency of violence against women. Area monitoring is insufficiently legally regulated and although institutions have the obligation to collect data there is no specific evidence of gender-based and sexual violence. Official statistics register the following: the number of cases of violence by the Interior Ministry, the number of lawsuits initiated and who initiated (the prosecutor or victim), the number of convictions, register card of the victim and the registration file of the person to who has been given the measure of protection.

According to data of the National Bureau of Statistics for the period since 2004. to 2009. in the number of reported adult persons for domestic violence is observed increase. While in 2004. there were 1009 applications filed cases of domestic violence, in 2009. was reported total of 3384 persons (of which 2699 in Central Serbia and Vojvodina 685). In 94.4 % of cases, the perpetrator was a man. The 2115 persons (62.5 %) was charged (1598 - 59.2 % in Central Serbia, and 517 - 75.5 % in Vojvodina). In the same year was issued a 1850 conviction, as follows: 372 (20.1%) to a prison (no data on the amount of fines), 171 (9.2 %) fines, 1265 (68.4 %) of the suspended sentence, 3 (0.2 %) to conviction work in the public interest, 26 (1.4 %) judicial admonition, 4 (0.2 %) corrective measures and 9 (0.5 %) cases were found guilty but the conviction.

The data do not provide a satisfactory picture of violence against women because they are not gender-sensitive. Republic Statistical Office of Serbia 2005. published the Report of Women and Men in Serbia, and it was for the first time published gender-sensitive statistics that are collected, but it would not show up in regular statistical publications, which was messy and un-systematic.<sup>21</sup> Based on the Strategy of Development of Official Statistics in the Republic of Serbia in the period 2009-2012, which was adopted by the Serbian government, gender-sensitive statistics should provide data for ongoing reporting under the Convention on the Elimination of All Forms of Discrimination against Women, as well as the provision of statistical data by sex, age and ethnicity when possible in all areas covered by this Convention.<sup>22</sup>

In addition to statistics which still is not gender sensitive, domestic violence in official statistics can hide behind other crimes such as crimes against life and body, offenses against the rights and freedoms of man and citizen, crimes against sexual freedom and Fig.

Gender-based non-governmental organizations also have their own records. Statistical data of Incest Trauma Center have been identified and incorporated into the corresponding national documents by Ministry of Labour and Social Policy of Serbia. These data do not indicate the true proportion of domestic violence against women because most cases are not reported to any institution or organization, but kept as a family secret.

Using data from analytical department of Ministry of Internal Affairs of Republic of Serbia, we made a comparative view of the total number of criminal charges and criminal charges for acts of violence in the territory of the Republic of Serbia in the 2011. and 2012. The following table shows the numeric display:

As shown in Table 1 data was given by numbers of criminal charges for acts of domestic violence by police departments. From this table it can be concluded where was made the largest number of crimes of domestic violence in relation to the total number of crimes. Belgrade, which is also the largest city in Serbia has the largest number of act of criminal domestic violence.

However, further analysis shows that the largest percentage of domestic violence was recorded in Kragujevac (6.3 %) and Smederevo (5.6%) and lowest in Kikinda (1.6%).

<sup>21</sup> Balon, B. 2007

<sup>22</sup> Službeni glasnik RS“, br. 55/05, 71/05, 101/07 i 65/08

Police Department	2011.		2012.		
	Total crimes	Domestic violence	Total crimes	Domestic violence	
Beograd	33 215	678	31 625	693	
Kragujevac	2 481	156	2 428	187	
Jagodina	2 117	90	2 100	57	
Niš	4 617	200	3 962	227	
Pirot	856	68	1 010	100	
Prokuplje	905	62	777	67	
Leskovac	2 031	113	2 030	172	
Vranje	2 122	103	1 854	111	
Zaječar	1 729	34	1 984	51	
Bor	1 813	142	1 847	187	
Smederevo	2 613	146	2 857	154	
Požarevac	1 833	71	2 024	53	
Valjevo	1 924	99	1 744	86	
Šabac	2 378	66	2 298	65	
Kraljevo	1 949	86	1 829	86	
Kruševac	1 804	76	1 604	84	
Čačak	1 636	44	1 656	35	
Novi Pazar	1 647	70	1 846	95	
Užice	1 635	67	1 519	54	
Prijepolje	444	33	445	35	
Novi Sad	12 165	240	11 473	276	
Sombor	2 291	78	2 308	165	
Subotica	3 357	80	3 269	104	
Zrenjanin	3 812	199	3 250	220	
Kikinda	2 391	55	2 419	39	
Pančevo	3 501	153	3 196	152	
S. Mitrovica	3 491	140	3 372	99	
AP KiM	70		89	1	
SBPOK	321		217		
SUK	239	1	187	1	
<b>Total</b>	<b>101 387</b>	<b>3 350</b>	<b>97 219</b>	<b>3 656</b>	<b>3,8%</b>

Table 1. Number of criminal charges for domestic violence to the total number of criminal charges, according to police departments. Source: analytical department of Ministry of Internal Affairs of Republic of Serbia

Table that was originally taken, does not display percentages, but only numbers, and at first glance it concludes that Belgrade is the place where domestic violence is the most numerous, as is true when looking at a number of criminal charges, but the picture becomes clearer when it is viewed in percentages, ie. ratio of the number of criminal charges of domestic violence and the total number of criminal charges. Within more detailed analysis and calculation of percent, we found that in smaller cities was a greater percentage of domestic violence, which may be interesting for some further research.

The number of domestic violence offenses by period of execution on the territory of the Republic of Serbia, ie. period when it was observed, as shown in the table, can only point out the trend of the year which is the riskiest for manifestation of domestic violence.

Month	2011.	2012.
January	278	249
February	232	237
March	285	315
April	236	266
May	284	269
June	261	297
July	261	343
August	280	333
September	336	308
October	274	311
November	305	363
December	318	365
<b>Total</b>	<b>3 350</b>	<b>3 656</b>

Table 2. Number of criminal charges for domestic violence by months. Source: analytical department of Ministry of Internal Affairs of Republic of Serbia

It can be concluded that there is a trend on the basis of Table 2, that in the autumn and winter period occurs most domestic violence. However, if the table showing both the perpetrators and victims of violence, if they showed their family relationship, if it is shown that the degree of injury was high or low, the number of family members, a description of the financial status of the family, etc., we can get a broader picture of drawing conclusions.

It is assumed that in the fall the family is closed in the house, they have increased the cost of education about children, and that the members more focused on the interaction between each others, and the result of all this can be the manifestation of a certain family pathology. It would be interesting to determine whether they are families with more members and weaker financial situation, but there is no information about it because they do not follow the statistics. Such data would certainly give a broader picture of the phenomenon, and it would be interesting to see if it that often manifested in working families, families of the middle class, and so on.

Gender and age structure of the aggrieved parties for domestic violence offences is also an element of the statistics kept by the Ministry of Interior. However, based on these statistics we can conclude only which are age and sex are the victim of domestic violence.

Age/Gender	2011.			2012.		
	M	F	total	M	F	total
Up to 6	22	15	37	22	20	42
7-11	39	28	67	41	36	77
12-14	36	40	76	36	45	81
15-17	49	64	113	39	80	119
18-20	41	81	122	30	95	125
21-30	84	492	576	102	497	599
31-40	54	687	741	96	711	807

<b>41-50</b>	92	544	636	80	579	<b>659</b>
<b>51-60</b>	143	430	573	191	472	<b>663</b>
<b>Over 60</b>	224	326	550	229	433	<b>662</b>
<b>Total</b>	784	2 707	3491	866	2 968	<b>3 834</b>
	<b>22,5%</b>	<b>77,5%</b>		<b>22,6%</b>	<b>77,4%</b>	

Table 3. Age and gender of victims in domestic violence. Source: analytical department of Ministry of Internal Affairs of Republic of Serbia

In 77.5% of cases of domestic violence victims are women, mostly aged between 31 and 40 years, and in 22.5% of cases the victims were men, usually over 60 years of age.

Based on these data we can create an accurate picture of the violence they have suffered as victims but missing following data: in which kin relationship are the perpetrator and the victim, whether the victim suffered serious or less serious injury, the degree of injury, type of injury the victim suffered by violence, whether it was repeated violence (relapse), which means the injury caused to the victim, and so on. If police officers took these data and statistically processed them, the image of the victims and the perpetrators would have been more complete.

Gender and age structure of persons against whom were filed by criminal act of domestic violence are part of the official statistics of the Ministry of Interior. Table 4 presents data on the age and sex structure of potential perpetrator of domestic violence.

Age/Gender	2011.			2012.		
	M	F	total	M	F	total
<b>Up to 14</b>				3	1	<b>4</b>
<b>14-15</b>	13		13	20	2	<b>22</b>
<b>16-17</b>	18		18	32	6	<b>38</b>
<b>18-20</b>	70	4	74	77	13	<b>90</b>
<b>21-30</b>	527	37	564	498	37	<b>535</b>
<b>31-40</b>	783	47	830	944	75	<b>1019</b>
<b>41-50</b>	773	44	817	738	44	<b>782</b>
<b>51-60</b>	529	37	566	578	29	<b>607</b>
<b>Over 60</b>	238	19	257	316	23	<b>339</b>
<b>Total</b>	2 951	188	3139	3 206	230	<b>3 436</b>
	<b>94%</b>	<b>6%</b>		<b>93,3%</b>	<b>6,7%</b>	

Table 4. Gender and age structure of the potential perpetrator of domestic violence. Source: analytical department of Ministry of Internal Affairs of Republic of Serbia.

Based on this table, in which we were calculated the total percentages, we can conclude the following: in 94 % of cases, men are the executors of violence, usually at the age of 31 to 50 years of age, while women in 6% of cases, also tend to age from 31 to 50 years of age. Based on the data given in the table it can not be seen the percentage in which age group is emphasized violence, and also can not be observed proportion of age groups in the violence. Percentage data to show that the age group of thugs is the most common and at first glance.

Furthermore, in order to get a comprehensive analysis, it is necessary to record the following: whether the violence is repeated, how many times repeated, was it previously convicted person and for what offenses, was it more than one person was injured in the incident, whether



it is caused minor or serious violations, whether he was under the influence of psychoactive substances, was he treated for substance abuse, whether child injured in the incident, and so on. Records that included the following information would be complete and would provide some general analysis.

On base of the official records of criminal charges for domestic violence in Belgrade, based on qualitative data obtained from the records of Police Department in Belgrade, in the 2013. we came to the conclusion that it is from 1.1. to 30.11.2013. was filed total 196 criminal charges under Article 194 of Criminal Law of the Republic of Serbia.

Abuser			Victim				Intoxicated	Detention	
husband	father	mother	son	wife	mother	father			child
<b>116</b>	34	2	62	116	39	26	36	77	136

*Table 5. PD (Police Department) Belgrade, reported cases of domestic violence, blood relationships between the perpetrator and the victim, the perpetrator condition, certain measures. Source: Official police records for the City of Belgrade.*

In our table (No. 5) we see the following data: in 59 % of cases are performed violence on husband against wife. In 17.3% of cases are performed violence on father against children, and even in 31.6 % of cases, the abuser is a son, which is in the 39 events of violence was done to the mother and the to the father was 26 events. In 39 % of cases, the perpetrator was drunk, and in 69 % of cases determined by the retention of Article 229 of CL RS for 48 hours. In 21.4 % of cases, the perpetrator used a knife. The obtained data we crossed in order to get a complete picture of domestic violence.

From the data recorded by the police officers who went to the event, we could get only basic information about the offender, the victim, the course of events in the presence of the police during the events that immediately preceded the arrival of the police, and the police superficial insight into the state of the perpetrator and the victim. There are missing list of measures of further police action (a measure of detention and criminal charges ex officio). We have not found in written reports information on whether the police acted according to the Protocol of Cooperation (adopted in 2011.) in cases of domestic violence.

Bureau of Statistics of the Republic of Serbia reports that the number of reported adult persons for criminal acts of domestic violence in the 2012. amounted to 3 624, of which 40.6 % are sentenced. The data show that the total number of prisoners are 65.9 % of offenders received a suspended sentence, 29.6 % of offenders are sentenced to prison, 2.2% of the fine, the 1% community service and suspension of driving licenses, 0.6 % on judicial admonition, 0.4 % of the educational measure and 0.2 % is found guilty and the punishment was remitted.

Statistical data relating to domestic violence, include only the following information: the number of reported adult persons for the criminal act of domestic violence, the number of adult persons convicted for the same offense, the number of prisoners for the crime of domestic violence, according to the offense and the sanction. The data are not disaggregated by sex and age of victims and convicts. Statistics of Centers for Social Work is the most complete, and we assume that this is due to the nature of their job, or the fact that they are directly and specifically faced with solving the problem of domestic violence, and they have an obligation to sue the procedure for protection against domestic violence, provide assistance to the Court in obtaining the necessary evidence to give an opinion on the appropriateness of the requested measures and record-keeping and documentation of domestic violence.

Based on records of CSW in the 2012. the number of recorded victims of domestic violence continued to grow. In relation to the 2006. which was the first year of implementation of the Family Code, in the 2012. was recorded almost three times more victims of violence (9,325 persons, which is 2.7 times more than 3,441 people in 2006). It can be assumed that this increase was the result of increased sensitivity to violence in society in general, as well as some lowered tolerance for the occurrence of domestic violence. This was largely due to more organized way beyond actions (campaigns) informing the population with the consequences of the phenomenon of violence, training of professionals and recommendations for responding to and how to identify violence as introduced, the legal measures of protection.<sup>23</sup>

<sup>23</sup> Synthesis report of the Centers for Social Work in Serbia for year 2012. - victims of violence, point 2.5.2.

CSW maintains records of victims of domestic violence since 2006. In relation to the areas of the Republic of Serbia, Central Serbia, Belgrade, Vojvodina, Kosovo and Metohija. The records includes the following information: the number of families that established the existence of violence and the number of victims, the age group of victims (children, youth, adults and the elderly) victims of violence by the dominant type of violence (physical violence, sexual violence, psychological violence, neglect, etc.) by age group, of the victims of violence against the backdrop of violence (family, foster or other family care center, etc.); structure of victims of domestic violence by the source (from a family member, another person outside the family, institutions, schools, health, kindergarten, Police report, the court's request, the Custodian, the victim, an anonymous login, someone else) procedures to protect victims of violence that CSW is initiated ex officio (the nature of the procedure - a procedure for imposing safeguards against violence, the procedure for the full deprivation of parental rights, the procedure for partial deprivation of parental rights, criminal charges, the procedure for the deprivation of the perpetrator, the procedure for interim measures of forced treatment process to protect the interests and rights of the child, something else, the number of procedures to age).

During the 2012. compared to the previous year, the number of applicants imposed measures against domestic violence by CSW, significantly increased by 304 or 39%. Most of the increased are number of banning further harassment of the family. Recorded data on the gender of the perpetrator as well as the relative / kinship with the victim group: children, youth, adults, the elderly).

Relationship between abuser and victim	Number of abusers 2011. - 5.450		Number of abusers 2012. - 6.121	
	M	F	M	F
Father	1575	0	1570	0
Mother	0	319	0	417
Brother/Sister	119	32	118	470
Son/Daughter	464	193	513	167
Partner	640	89	973	110
Other member of the family	518	166	681	198
Foster parent	5	5	3	8
Neighbour/Friend	28	3	27	10
An adult who takes care of the victim in residential institutions	1	0	2	1
Teacher	4	2	8	2
Peer	57	13	151	41
Unknown person	12	2	13	3
Someone else	854	100	528	258
<b>Total</b>	<b>4.277</b>	<b>924</b>	<b>4.587</b>	<b>1.262</b>

Table 6 The structure of the abuser to the relative / kinship thugs with victims during the reporting period. Source: Report on the Centers of Social Work in Serbia for year 2012.

CSW is recorded the number of children witness of domestic violence. The number of children who are registered in Serbia as witnesses of domestic violence during the reporting period 2012., for the first time exceeds three thousand and is 3017.

## CONCLUSION

Domestic violence is very widespread socio-pathological phenomenon which has a huge number of victims, mostly women and children and is treated as a form of gender-based violence. It also has long-term ill effects on the health of victims and family functionality. Globally, there are consequences to society as generations of children who have suffered and experienced violence in primary family transferred socialization adopted from their parents, especially the vulnerable boys who later may exhibit a heightened level of aggression towards future partners and the environment.

In our research, we found that the official statistics of state institutions in Serbia is mostly partial, not unified, and not contains all in one place information about domestic violence. Partial statistics provide only a partial picture of the problem of domestic violence. Official institutions do not adequately monitor the extent and frequency of violence against women. The main disadvantage is a different methodology documentation, though this is somewhat understandable (because that institutions are engaged in different activities). We need to keep records in one place, to record and collect data on domestic violence as gender-sensitive, to make subsequent production of statistical reports which could be compared and complement, and finally to form a single database on domestic violence.

These data do not indicate the true proportion of domestic violence against women because most cases are not reported to any institution or organization, but kept as a family secret. That are clearly indicated, and data from national surveys. Due to the different definitions of domestic violence, the methodology used, different patterns and the degree of reliability of research conducted, the results of these studies are difficult to compare. These studies have not been conducted on a nationally representative sample, but they certainly offer important initial insights into the characteristics of domestic violence.<sup>24</sup>

Accurately record data pertaining to all the details and circumstances of the violence done, setting clear and precise questions, carefully observing and recording the description of the victim and the perpetrator, the subsequent classification of data by clearly defined methodology will greatly improve the knowledge about the occurrence of domestic violence, its treatment and prevention.

The state has a huge responsibility in preventing and combating domestic violence. State institutions which are required to provide an institutional response to violence should in addition to raise the level of knowledge about violence and to promote measures that these institutions is carry out as its work.

Also, it is necessary to wake up confidence in state institutions to victims, vulnerable groups, and general population. The dark figure (failure) of victims of domestic violence is a reflection of (dis) trust in state institutions and is (not)knowledge that the state can and wants to help and to protect.

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<sup>24</sup> Babović, 2010: 30

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## THE FEATURES OF THE TRANSITIONAL COUNTRIES' INTERNATIONAL TRADE

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**Abstract:** After the fall of the communist regimes in all Eastern European countries in the late 1980s, the process of economic transition began, which implied abandoning centrally planned model of economy and transition to the market economy.

Same as developed countries, the transition countries became open to international trade and finance. These countries are expected to create debts to acquire capital goods, and as production would grow, country would be able to repay its debt. Unless adequately managed, the debt can be harmful, since indebtedness can slow down the growth if used to finance current expenditures at the expense of investments.

**Keywords:** transition, international trade, fiscal policy, monetary policy, foreign currency exchange rate.

### INTRODUCTION

International trade represents exchange of goods and services across national borders, with companies as the main carriers of this activity, and the national economies as the main regulators of this activity. National economies are undertaking various measures to regulate this activity in accordance with the interests of the social community, at the same time taking into account that the interests of society and the business community may be opposed. Government measures are laws and bylaws, as well as practical measures which have a direct impact on the flow of international trade, that is, on foreign trade of a specific country. However, international trade is of transnational character, and in this context, international trade relations which a country establishes with other countries directly, or through multilateral international institutions, are important. Approach strategy of individual countries in the field of international trade is called a foreign policy, and it includes a variety of foreign laws, customs law, law on foreign exchange operations and other similar laws and by-laws, as well as specific tools based on these regulations. It is also important to emphasize that each country decides on a particular model of foreign policy, and the two basic models are liberalism and protectionism, which vary according to the framework of the trade measures that countries establish in trade with other countries.<sup>1</sup>

Activities of stakeholders of international trade, namely national economies and companies, are necessary for international trade to take place. The role of national economies in the field of international trade is reflected in the establishment of international trade relations in cooperation with other countries of the world, but also in unilateral influence of a country on the business sphere. The main determinants that affect involvement of a given country in the sphere of international trade are: the size of the territory measured in km<sup>2</sup>, population and available natural resources. According to the criteria of the position of national economies in international trade, they can be divided into developed economies, developing economies, and economies in transition. The success of the stakeholders of international trade, both economies and companies, within international trade flows, is measured through the complex category of competition, which may be the macro international competitiveness and the micro international competitiveness. The former examines the competitiveness of the national economy with other national economies, while the latter examines the competitiveness of companies in international business in relation to the foreign companies' competitiveness.<sup>2</sup>

<sup>1</sup> Bjelić, P. (2008). *Međunarodna trgovina*, Beograd, Centar za izdavačku delatnost Ekonomskog fakulteta.

<sup>2</sup> *Op. cit.*



## THE INTEGRATION OF TRANSITION COUNTRIES' ECONOMIES IN THE WORLD TRADE

The transition economies are undergoing the process of change of the country's role by allowing the private sector to have a bigger role, which is in line with the market-oriented approach advocated by the World Trade Organization. Those agencies and companies that remain in the government's property will need to adjust their way of doing business, including the way of procurement of goods and services, for which there are economic and legal reasons. There is a certain reserve about privatization, as well as foreign direct investment, and there where these were accepted, questions are raised about the precise time dynamics. In those countries where the privatization of basic monopoly services was carried out, the role of the country shifted to the regulatory function. Within certain activities related to the private sector, non-interventionist approach for competition should be justified by considering issues related to the market, while in other activities, proactive policy is necessary to ensure the benefits of economic liberalization.<sup>3</sup>

Numerous efforts have been made by different stakeholders, mainly multilateral financial institutions, regional development banks, export credit agencies, etc., to mobilize larger flows of trade finance for developing countries, in order to help them to integrate into the global trade. Being an institution that takes care of a balanced expansion of world trade, the World Trade Organization enables world trade. Its many functions include the reduction of trade barriers, negotiation and implementation of global trade rules and dispute resolution based on the rule of law. Furthermore, the WTO is interested in strengthening the economy of supply in developing countries so that they can respond to new market opportunities. So far, it has supported a variety of initiatives aimed at improving trade infrastructure in developing countries, starting from the ability to meet international standards for products relating to safety and sanitation standards, to the efficient operation of customs or the effective participation in multilateral trade negotiations through civil servants training. The WTO implements various initiatives with other partners (institutions, public and private sector) in the context of its own programs of professional assistance or in the context of multi-agency projects, such as the Aid for Trade Initiative. Since the efficient financial system is one of the infrastructural elements that facilitate trade, and because the WTO is not a financial institution, in recent years it has supported partners involved in these effort, such as international financial institutions, export credit agencies, major banks and regional development banks. Liquidity in financial markets was improved until the recent turmoil caused by the crisis in the secondary real estate market, hence the financing of the trade remains to be the subject of attention of members of the WTO, practically the poorest ones, since they do not have access to international financial markets, as well as developing countries that remain prone to the effects of changes in market sentiment, and consequently credit rating.<sup>4</sup>

The links between trade and resource mobilization are complex and theoretically not well explained. To what extent trade policy affects the mobilization of resources and through which mechanisms? One might argue that the trade policy is a key factor affecting domestic fundamental balances of aggregate savings and investment. The main effect of trade policy on resource mobilization stems from its contribution to the static and dynamic gains from trade, but the effect of trade policy on the supply of financial resources functions through several channels, including links of trade policy with foreign investment, national income, income distribution, foreign aid, etc. It is necessary to examine both direct and indirect trade channels, then make a distinction between short-term and long-term effects of the implemented trade strategies, understand how liberalization of trade barriers in trade in goods and services may bring potential benefits, etc. The long-term benefits of trade liberalization are essential, but they can be set in such way so as to be in conflict with short-term adjustment costs. The latter can and should be reduced by means of effective institutional and tax reforms.<sup>5</sup>

3 Laird, S. (1998), *Transition Economies, Business and the WTO*, Staff Working Paper TPRD-98-03, World Trade Organization, Trade Policy Review Division.

4 Auboin, M. (2007), *Boosting Trade Finance in Developing Countries: What Link With the WTO?*, Staff Working Paper ERSD-2007-04, World Trade Organization, Economic Research and Statistics Division.

5 Drabek, Z. i S. Laird (2001), *Can Trade Policy Help Mobilize Financial Resources for Economic Development?*, Staff Working Paper ERAD-2001-02, World Trade Organization, Economic Research and Analysis Division.

Trade policies related to financial services are important, but often overlooked as determinants of capital flows and financial sector stability. The liberalization of trade in financial services that promotes the use of a wide range of financial instruments and allows the presence of foreign financial institutions, without unduly restricting their business practices, results in a less distorted and less variable capital flows and promotes the stability of the financial sector. Researches show significant evidence in favour of this claim, through an empirical analysis of commitment to the GATS principles (General Agreement on Trade in Services) that was carried out in 27 emerging markets. For example, countries that have gone through a financial crisis between 1991-1997, have a combined indicator of financial services trade restrictiveness that is three times higher than in countries that have not gone through the crisis. Two findings have significant implications for policy-making. Firstly, the liberalization of international trade in financial services can be a market-based tool for improving the quality of capital flows and for strengthening the financial system, which must be in line with other policies related to financial regulation. Secondly, even in those countries where the financial system is weak and where full liberalization of the financial sector is not desirable, certain trade in financial services should be liberalized, since such trade strengthens the financial system without causing destabilizing capital flows.<sup>6</sup>

Discussion about international capital flows has set many important and controversial questions. Why would countries open their capital accounts, especially if we bear in mind that unrestricted international movements of the capital are relatively new phenomenon? For instance, many OECD countries have not eliminated restrictions relating to the foreign currency exchange rate up until 1980s. If the answer is definitely positive, does it matter how fast the countries are supposed to implement this? Are they supposed to wait until all the essential parts of the package of policy measures are adopted before they eliminate all restrictions? What is the connection between international movements of capital and domestic financial sectors? Is there any difference between allowing a competition to enter an industry such as auto industry compared to the banking sector? Should opening of the banking sector be guided by a different set of rules? The rules related to the restrictions on the foreign currency exchange rate already exist in the IMF's documents. Until recently, they stipulated the removal of foreign exchange restrictions that apply to the current account. These questions have implications for the WTO, as it is well known that the agreements from the Uruguay Round have already covered a number of aspects directly related to foreign investment. Rules established elsewhere, such as those in the context of changes of the IMF's documents, obviously constitute an important guideline for the application of the rules established in the Uruguay Round.<sup>7</sup>

Management of capital inflows has suddenly become a major challenge for the economies in transition. These countries were expected to have an insatiable demand for foreign capital, and therefore, the excessive need for capital inflows was anticipated by many researchers. Foreign investors are known as very picky when it comes to the selection of a market, and these countries represented a great unknown. Furthermore, macroeconomic policy in these countries was permeated with disinflationary goals. The reasons why some transitional countries were attractive market for foreign investors, and how significant the flow of capital to these countries was, are very important. Government policies for managing capital inflows were important in this context - the set goals, the applied instruments, the time and costs of interventions. The authorities were reluctant to adapt their original policies and learn from the experiences of others, and finally their policies were changed when the costs became too high due to inertia. Authorities have effectively used the policy of sterilization, a policy of more flexible exchange rate combined with strict monetary and fiscal policies. They also realized that effective management of capital flows must start from well-functioning markets and were ready to adopt appropriate structural policies whenever some market imperfections were identified.<sup>8</sup>

6 Kono, M. i L. Schuknecht (1998), *Financial Services Trade, Capital Flows and Financial Stability*, Staff Working Paper ERAD-98-12, World Trade Organization, Economic Research and Analysis Division.

7 Wiliamson, J. i Z. Drabek (1999), *Whether and When to Liberalize Capital Account and Financial Services*, Staff Working Paper ERAD-99-03, World Trade Organization, Economic Research and Analysis Division.

8 Drabek, Z. i S. J. Griffith (1998), *Managing Capital Flows in Transition Economies with a Case - Study of Central and Eastern Europe*, Staff Working Paper ERAD-98-04, World Trade Organization, Economic Research and Analysis Division.

## THE IMPACT OF TRANSITION COUNTRIES' ECONOMIC POLICIES ON INTERNATIONAL TRADE RELATIONS

There are numerous research papers related to the examination of the impact of different packages of economic policies of transition countries and their direct and indirect impact on international trade flows. Economic policy implies government actions that affect the economy, and international trade and finance are affected by this policy. Two manifestations of economic policy are fiscal policy, which includes government expenditure and taxation, and monetary policy, which implies government control of the money supply. There may be a need for fiscal and monetary policies to affect the current and capital account, although there are various expert opinions on the role and effectiveness of these policies. Some take the side of the active political intervention that would affect unemployment and recession, while others take the side of the passive political actions and market adjustment to achieve balanced budgets and zero inflation.

There were debates on how it is less likely that countries with flexible exchange rate regimes will use expansionary fiscal policy before the elections, since such a policy could cause devaluation and inflation, which then negatively affect the government's popularity. The empirical results indicate that governments in fact are trying to improve their chances of re-election with the aid of an expansionary fiscal policy only in countries with fixed exchange rate and adequate level of foreign exchange reserves. For some countries, this raises doubts regarding the usefulness of a fixed exchange rate for stabilization of the macro economy, unless the reforms of the institutional framework do not diminish the possibility for election-oriented fiscal expansion. In other words, such short-term incentives can undermine the long-term disciplinary effect of applying a fixed exchange rate to macroeconomic policy through the balance of payments restrictions. These findings have important implications for the selection of an exchange rate regime.<sup>9</sup>

When a country spends more than it earns, income deficit is produced through which the national debt is created, when a country issues bonds for its coverage. Bonds are bought by individuals, firms, the central bank, foreign investors and foreign central banks. If the central bank buys a bond, then it is paid through new emission of money, which increases the money supply, which amounts to the impact of monetary policy. When private sector buys bonds, the funds are redistributed from the private to the public sector. Government expenditure is growing at the expense of consumption and investment, as consumers and businesses are spending on the bonds instead of consumer and investment goods. The need for borrowing increases due to government decision, hence interest rates or the cost of credit increase, while with the increased supply, bond prices fall.

The bond market has implications on the economy open to foreign financing. Higher interest rates and cheaper bonds attract foreign investors who want to buy cheaper bonds. Demand for domestic currency in the foreign exchange market is growing, causing currency appreciation, which in turn makes the import cheaper and export more expensive, which then pushes the balance of payments into deficit. Numerous empirical studies indicate that fiscal policy is a poor tool for influencing the balance of payments, as for this purpose far more efficient are the use of instruments and commercial policy measures, such as tariffs, quotas, non-tariff barriers, export subsidies, etc. In this respect, trade policy is much more efficient compared to fiscal and monetary policy, when it comes to dealing with issues in the sphere of foreign trade. Government debt created by expansionary fiscal policy and financed by emission of government bonds has different implications for the economy, depending on the fact who emerges as the buyer of these bonds. Buying of bonds by foreign persons leads to currency appreciation, inflation results due to expansionary monetary policy, which also reduces the value of the domestic currency, that is, its depreciation occurs, while purchases of government bonds by local persons lead to crowding out of private investment.

Monetary policy also influences the international trade and finance. Inflation occurs when the money supply grows faster than the supply of goods and services. Inflation and expected inflation may have real effects on the economy through the credit market and the foreign exchange market. Steady growth in money supply leads to low and potentially zero inflation. Central banks regulate the money supply and in this way influence the economic cycle. The idea

<sup>9</sup> Schuknecht, L. (1998), *Fiscal Policy Cycles and the Exchange Regime in Developing Countries*, Staff Working Paper ERAD-97-04, World Trade Organization, Economic Research and Analysis Division.

is that increased money supply reduces interest rates and encourages investment, and this is done in a way that the central bank lowers its discount rate at which commercial banks borrow. Steady growth in the money supply leads to stable interest rates and reliable exchange rate, so that entrepreneurs, traders and investors are able to make better plans in conditions of a stable monetary growth and stable prices. Therefore, neither fiscal nor monetary policy should be used to influence the international trade and investment. Governments have at their disposal an entire range of options that affect the international trade: tariffs, quotas, non-tariff barriers, voluntary export restraints, export subsidies, free trade zones, controlled foreign exchange rate, fixed foreign exchange rate, foreign exchange restrictions and foreign investment control.<sup>10</sup>

All stakeholders in international trade are addressed to the international foreign exchange market, where international means of payment are bought. The demand for foreign currencies comes from domestic buyers of foreign goods and services, intermediate goods, capital goods and property, while foreign currency supply comes from foreign buyers. Supply and demand are constantly confronted in the foreign currency exchange market thus determining the foreign currency exchange rate as the relative price of currencies in trade. The platform for currency trading is a global network that connects banks, foreign exchange brokers, traders and central banks. Central banks often buy and sell currencies in an attempt to influence and manage foreign currency exchange rates. Many central banks have fixed exchange rates set by agreement in order to achieve certain political goals. A depressed or devalued currency means more expensive import and cheaper export. Government may devalue the fixed currency exchange rate to discourage import and mitigate the trade deficit. Undervalued currency represents a tax on consumers who must pay higher prices for imported goods. Government can also overvalue the currency if it wants to encourage foreign investment. The foreign exchange market is connected to the international market of goods and resources, in which a currency may be depreciated or appreciated. In the case of currency depreciation, the value of domestic money falls compared to foreign money, followed by the decline in the purchasing power of foreign goods and services, and export becomes cheaper when expressed in foreign currency. Vice versa, appreciation means a strengthening of the domestic currency, which increases the purchasing power of foreign goods, but also raises the price of domestic exports. The export does not need to be elastic to shift the current account to surplus by depreciation of the currency. If the sum of the elasticity of import and export is higher than one, then the depreciation leads to a trade surplus, and this rule is called the Marshall-Lerner condition.<sup>11</sup>

Foreign exchange rate policy in its various modes affects the stability of trade policy. Stable trade policies are highly important for both economic well-being of the countries themselves and preservation of the multilateral trading system. Unfortunately, there is a reason to believe that the liberalization measures adopted by many countries, particularly those in transition, have remained extremely fragile. It is necessary to consider whether transition economies may use changes in trade policy as a replacement for the adjustment of the exchange rate, or instead of the application of monetary and fiscal policy in dealing with the problems of imbalance of the balance of payments. In transition economies, the use of trade policy to improve the balance of payments is attractive on multiple grounds. For instance, it meets the requirements of domestic and foreign investors for protection, it increases revenues and allows governments to target the protection so that the benefits from some goods are higher than from the others, which is not possible by applying uniform exchange rate in macroeconomic policy. Furthermore, such a policy is likely to cause substantial damage to countries in which prices over a long period have differed from the prices on the world market, and whose economies, as a result, are in extreme need for restructuring.<sup>12</sup>

Governments may use different methods to influence the international trade and investment. Managed foreign exchange rates are offered as an easy way for the government to influence the prices of tradable goods, services and investments. Governments may try to keep the price

<sup>10</sup> Thompson, H. (2006), *International Economics – Global Markets and Competition*, World Scientific Publishing Co.Pte.Ltd, 2<sup>th</sup> Edition.

<sup>11</sup> *Op. cit.*

<sup>12</sup> Drabek, Z. i J. C. Brada (1998), *Exchange Rate Regimes and the Stability of Trade Policy in Transition Economies*, Staff Working Paper ERAD-98-07, World Trade Organization, Economic Research and Analysis Division.

of their currency higher in order to cheapen import and attract foreign investors. Appreciated currency keeps a low cost of intermediate products or capital goods for the domestic industry. Stable or appreciated currency can attract foreign investors who want to avoid foreign exchange risk or depreciated currency. Appreciated currency also facilitates repayment of country's foreign debt. One of the ways to maintain the value of the domestic currency without having to spend foreign currency reserves is to limit import to a level at which the exchange rate would be artificially maintained, by issuing import licenses. Black foreign exchange market may occur when a fixed exchange rate is by far different from the one which would have been formed in the free market. The floating exchange rates system is more acceptable because the inflation rates vary from country to country, and in such situations, the exchange rate has to adjust. Also, exchange rates influence the direction and level of international funding, because if the local currency depreciates, foreign investors will want to buy more stocks and bonds, which then become cheaper. Depreciation reduces the relative price of domestic financial instruments and encourages country to become a lender. The main role which countries should play in the international financial market is to control the money supply, which actually is the task of the central banks. The countries should not control or attempt to influence international financial flows. Successful management of international financial markets is beyond the reach of countries, but it is difficult for them to refrain from trying. There are sound reasons for the existence of free international financial markets, since they allow economic stakeholders to plan, increase productivity and grow on healthy foundations, and also, international financial competition increases the global benefits.<sup>13</sup>

## CONCLUSION

The transition economies are undergoing the process of change of the country's role by allowing the private sector to have a bigger role, which is in line with the market-oriented approach advocated by the World Trade Organization. The liberalization of trade in financial services that promotes the use of a wide range of financial instruments and allows the presence of foreign financial institutions, without unduly restricting their business practices, results in a less distorted and less variable capital flows and promotes the stability of the financial sector.

Same as developed countries, transition countries are using monetary and fiscal policy to influence what is produced, how it is produced and how the income is distributed. The long-term benefits of trade liberalization are essential, but they can be set in such way so as to be in conflict with short-term adjustment costs.

There are fundamental differences in the way how an economy open to international trade and investment behaves and how it reacts to macroeconomic policy. Foreign currency exchange rate and international investment play a significant role in open macroeconomics. In an open economy, policy makers in the country have at their disposal additional tools for macroeconomic policy, and these are a fixed exchange rate and foreign investment control.

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## INTELLECTUAL PROPERTY AS A SOURCE OF ECONOMIC DESTRUCTION AND POLICE IN THE FUNCTION OF PROTECTION

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**Abstract:** The expansion of the abuse of intellectual property rights has caused the creation and implementation of effective and proportionate administrative, civil penalties and measures for the purpose of its protection, and prevention of illegal commercialization of creations of the mind.

Starting from the fact that the freedom of scientific and artistic creation is guaranteed by the Constitution and that intellectual property is a powerful tool for economic growth, the reasonableness of the public interest in taking action to protect intellectual property rights by the authorities is anticipated. As it is known that an adequate intellectual property protection contributes to the country's efforts to attract foreign investment and promote international trade, inadequate attitude towards protection leads to a decrease in budget revenues, foreign investment, and generally devastating conditions for growth and the occurrence of destructive factors which affect the economy of the country.

In this paper, the emphasis is primarily placed on the function of protection of intellectual property rights by the Ministry of Internal Affairs of the Republic of Serbia, and the basis for taking action is the criminal-law protection of intellectual property rights provided in the Criminal Code of the Republic of Serbia in the group of offenses against intellectual property. The scope, authority and structure of the results of the measures taken by the Ministry of Internal Affairs in this area, will also be defined.

This research work represents an attempt to convert the issue of destruction related to intellectual property to contemporary trends and to point out the principles of a complex process that requires an interdisciplinary approach of experts from the fields of economics, law and criminology.

**Keywords:** intellectual property rights, police, protection, destruction.

### INTRODUCTION

The term and the general concept of intellectual property is still not fully known and is often mystified and even identified with copyright, although it consumes industrial property, copyright and related rights, as well. The justification of including these two branches of law in one, i.e. their generating, lies in the similarity of their meaning and common applications. As intellectual property itself is complex, for the sake of its interpretation, multi-disciplinary knowledge and its observations from different angles are needed. In addition to national laws, strategies and scientific fund, in defining the concept, content and protection of this branch of law, the sources of international law that occur in the form of conventions are the greatest contribution.

In order to achieve adequate protection of intellectual property, which has become the most expensive commodity on the international market, public awareness has to be raised and everyone must be shown the risks and tolerant approach to the absence of favoritism. This paper aims to highlight the importance and justification of protection as well as negative factors that destroy the country's economy and society as a whole.

Since the protection is put into effect at different levels and by various organs, the intention is, by reading this article, to achieve the effect of information on protection at the level of the Ministry of Internal Affairs of the Republic of Serbia, which has been neglected in the current scientific researches. Also, the goal is to create a brief guide to the seriousness of the problem in terms of criminal law. The absence of creation of protective mechanisms for intellectual property and the lack of support for these mechanisms by the police can only lead to the degradation of the system and allowing the perpetrators of criminal acts freely acting, either individually or in the form of organized crime groups.

In analyzing these issues the attention must be paid to the collaboration. It is the collaboration between organizations in Serbia dealing with intellectual property, as well as cooperation outside the state in the form of exchange of information, the signing of the Convention and their observance and cooperation with international police organizations. Only in this way, along with professional development and the exchange of practical experience, prevention and repression of criminal activities in this area can be effective.

## DEFINITION AND CLASSIFICATION OF INTELLECTUAL PROPERTY

In the broadest sense, intellectual property implies the rights that are the product of intellectual activity in all fields of creativity. However, when we talk about intellectual property, it is not the product itself, but it is connected to form of the ideas, intangible object, disembodied well, and it is a creation of the human mind and the way it is expressed.

Intellectual property is a term that refers to the ideas, inventions, technology, art, music and literature, immaterial at the moment of creation, which then in material form, as products, get a certain value.<sup>1</sup>

In legal theory, intellectual property is unique generated concept for industrial property and copyright. Precisely, for the basic source of international industrial property rights and copyrights is the Convention for establishing of the World Intellectual Property Organization. The Convention on intellectual property rights includes the following:

- Literary, artistic (art) and scientific works
- Performances of performing artists, phonograms and broadcasting programs
- Inventions in all fields of human activities
- Distinctive signs (trademarks, appellations of origin)
- Industrial design
- Protection against unfair competition
- Scientific discoveries

As well as other rights resulting from intellectual creativity in the fields of economy, science, literature and art (Article 2 of the Convention)

It can be concluded that the name of intellectual property means the branch of law that governs patent, design, trademark, designation of origin, protection of topographies of integrated circuits, plant varieties, utility models (industrial property) and copyright, the rights of performers, producers of phonograms, videograms, emissions, data base and the first publisher of a free work (copyright and related rights).<sup>2</sup>

Intellectual property requires attention of domestic, foreign and international institutions, as well. In Serbia, the primary role in this area was given to the Institute for intellectual property based in Belgrade, while the most important role at the international level belongs to the World Intellectual Property Organizations.

The Institute for intellectual property of the Republic of Serbia is the national center for intellectual property protection and the provision of strategic information regarding the intellectual capital. The Institute for intellectual property supports the development of a competitive knowledge-based economy, and the general progress of the Republic of Serbia.<sup>3</sup> The World Intellectual Property Organization (WIPO-World Intellectual Property Organization) is a global forum for intellectual property, services, policies, information and cooperation. It is self-financed agency of the United Nations with 186 Member States with headquarters in Geneva. Mission of the World Intellectual Property Organization is to promote the development of a balanced and effective international intellectual property rights as a system that allows innovation and creativity for the benefit of all.<sup>4</sup>

1 Idris, Kamil; *Intellectual Property – A power tool for economic growth*; World Intellectual Property Organization; Geneva; 2009; p. 9.

2 Besarović, Vesna; *Intelektualna svojina*; Pravni fakultet univerziteta u Beogradu; Beograd, p.25.

3 <http://www.zis.gov.rs/o-zavodu/%D0%BC%D0%B8%D1%81%D0%B8%D1%98%D0%B0-%D0%B8-%D0%B2%D0%B8%D0%B7%D0%B8%D1%98%D0%B0.319.html>

4 <http://www.wipo.int/about-wipo/en/index.html>

## JUSTIFICATION OF PROTECTION AND DESTRUCTIVNESS CAUSED BY THE ABSENCE OF PROTECTION

The resources of the industrial age have lost their importance, because now a modern business systems increasingly emphasize their intellectual capital (intangible assets) as a part of the market value of the equity. Moreover, this type of property takes precedence over industrial property as intangible assets when incurred within the business system, due to its specificity is very valuable, and is the main driver of growth and development of the system, and it is the key competitive advantage.<sup>5</sup>

In developing countries, their societies and economies there is a need for the creation and implementation of new technologies and the dissemination of knowledge, however, there is a need for different types of effective protection of the author and establishment of a legal and regulatory trade of these rights. Protection should not be limitative, issuing of protection must not cause the creation of a barrier, it must remove distortions in international trade and encourage free trade.

Currently the development of Serbian economy is based on investments and aims at the modernization and improvement of industry and technological resources (equipment, machinery and software), as well as the expertise of the employees. The growth of the Serbian economy still relies mainly on domestic demand, which is not sustainable long term, and therefore the economy should be largely export-oriented and based on innovations. Serbia needs to move from the investment phase into the innovation phase, i.e. the phase driven by innovations, with the economy which will focus on products with higher added value, which are globally competitive, and more jobs that require better and more professional qualifications, in the internationally competitive sectors which record high growth.<sup>6</sup>

Intellectual property rights contribute to the society by: maintaining fair competition and encouraging the production of a wide range of quality goods and services, strengthening economic growth and employment, supporting innovations and creations, promoting technological cultural progress and enrichment of the general knowledge of the society.<sup>7</sup>

So, in addition to the interests of the country to protect the intellectual property for the use of the moral and economic rights of authors and because of availability of their creations, there is also an interest that can be contemplated from an economic and social point of view, which is manifested in the form of promoting of creativity and inventions in order to promote fair trade. States that know how to care, value and charge intellectual property are guaranteed a monopoly position in the international market and strong economic growth.

Effort in creating an intellectual property in order to achieve the goal aspired by the creator can be defined as one of the criteria for granting protection, and that, as far as intellectual property is socially useful sets out the justification for its protection.

Enforcement of intellectual property rights is increasingly important because of the stunning expansion of operations that is based on objects which are protected by certain intellectual property rights. In most countries, the holder of intellectual property rights owns different options to protect his rights and, depending on the characteristics and nature of the violation, the actions undertaken by the holder will be the responsibility of the civil or criminal courts, market inspection, customs or police.<sup>8</sup>

In recent years, the Republic of Serbia sees progress in taking measures to protect intellectual property rights. However, there are no common records of the suppression and sanctioning threats to intellectual property because they are not collected and handled in an appropriate manner. Only Customs document by statistic data the measures taken to prevent the importation of illegal goods.

Nowadays Serbia has the quality of laws in this area, it is a signatory to most international agreements in the field of industrial property and copyright and related rights, and has continued and good cooperation with major international institutions of this kind, especially with the

5 Aleksić, Dušan; *Zaštita intelektualnog kapitala u konkurentnoj privredi*; *Bezbednost* br.3; Beograd; 2007. p.109

6 [http://www.zis.gov.rs/upload/documents/pdf\\_sr/pdf/Analiza%20inovacione%20delatnosti%20u%20Srbiji.pdf](http://www.zis.gov.rs/upload/documents/pdf_sr/pdf/Analiza%20inovacione%20delatnosti%20u%20Srbiji.pdf)

7 Jelisavac, Sanja; *Intelektualna svojina*, Institut za međunarodnu politiku i privredu; Beograd; 2006. p.52

8 Marković, Miodrag; *Kratki vodič kroz pravo intelektualne svojine*; ATC; Beograd; 2011; p.91

World Intellectual Property Organization (WIPO) and the European Patent Office (EPO). In the report that the European Commission published on October 10<sup>th</sup> 2012, concerning the progress of Serbia's European integration, our country has received a good mark when it comes to the protection of intellectual property. It is said, among other things, that we have very good legislation in this area which are to the fullest extent unified with the regulations of the European Union.<sup>9</sup>

The hardest thing is to define the level of protection, because protection is needed to achieve the effect of economic development and international competitiveness, not to lay the foundation for the creation of destructive circumstances. The problem is in finding the right measures, because more stringent protection may lead to the monopolization of certain manufacturers, a higher power of foreign investors on the market causes losses in the host country. Adverse effects on the recipient of the investments occur as a result of relocation of production in favor of foreign companies. Adverse effects that occur when enhanced protection, occur in situations when a foreign investor just loses interest because of excessive protection and his assets and innovation places on the market free of imitation. Thus, the strength of protection can be contemplated from the negative aspects as a risk factor for international trade. On the other hand, it is argued that a high level of protection is justified and benefit is mutual, for both the recipient country and the source country. However, if there is no protection on adequate level, innovations become available for use free of charge, there is a reduction of the potential benefits and return on investment, and manufacturers are losing interest in investing in intangible assets, and thus the development.

Protection that is not well-balanced from the standpoint of social and private interests makes the cost to the state. The economic costs of inadequate protection of intellectual property are: losing interest from foreign firms to innovate in a country where there is inadequate protection, the potential net loss of initiative for every inventive work, rejection of foreign firms to transfer cutting-edge technology, the decline in foreign direct investment, and more.<sup>10</sup>

One of the destructive impact on the local economy are certainly repressive measures of foreign countries in the field of trade, whose cause of deviations from the measures of protection and tolerance is violation of intellectual property rights. So, if the state seeks to increase imports, favorable position in the international market, the development of foreign trade, it must encourage investment in intellectual property and protect it.

An effective system of intellectual property protection is an integral part of the business environment which has favorable effect on the development of domestic knowledge-based economy, which acts as an incentive for research and development projects and development of the new economy. Thus, the Serbian economy can, from the substantial net user of protected intellectual property become their net lender, which can have favorable effect on its foreign trade performance in the medium term, as well as long term.<sup>11</sup>

Although there is a real danger to the country's economy if protective factors fail, I will mention no less important consequences for society, in terms of effects on health and life. Although works of art (music, film, literature ...), are considered to be the most common cases of adulteration and piracy, the severity of the problem is far greater.

When we talk about a higher level of seriousness and danger to the health and safety of people, we refer to the increasingly forgery in the production of pharmaceuticals and medical devices. The risks to human health are the chemicals for agriculture, personal hygiene and the like. Unforeseeable consequences arise as a result of adulteration of aircraft and car parts. This is supported by data on the causes of aircraft accidents. Therefore, these types of production of goods of poor quality cause the death of innocent victims, which is why this area attracts more and more attention.

9 [http://www.madmarx.rs/Istrazivanja/Maric-Vladimir\\_Zastita-intelektualne-svojine-u-Srbiji.pdf](http://www.madmarx.rs/Istrazivanja/Maric-Vladimir_Zastita-intelektualne-svojine-u-Srbiji.pdf) p.4

10 Jelisavac, Sanja; *Intelektualna svojina*, Institut za međunarodnu politiku i privredu; Beograd; 2006 .p.51.

11 Strategija razvoja intelektualne svojine za period od 2011 do 2015; Na osnovu člana 45. stav 1. Zakona o Vladi („Službeni glasnik RS”, br. 55/05, 71/05 – ispravka, 101/07, 65/08 i 16/11)

## CRIMINAL LAW PROTECTION OF INTELLECTUAL PROPERTY

Exploitation and commercialization of these goods, as intangible assets that are eligible to enjoy the protection of the various branches of law, is provided because it is generally equated with property rights.

The subject of intellectual property rights are spiritual creations and the right of the creator, the author on the result of his intellectual creativity, hence comes the name of intellectual property.<sup>12</sup> Today the judicial protection of intellectual property rights is exercised by a civil, criminal and administrative protection. From the corner of my interest, emphasis will be placed on the criminal protection. Legal protection has an important role in the protection of intellectual property rights, and by its very nature is also the most effective form of protection. Agreement on Trade-Related Aspects of Intellectual Property Rights<sup>13</sup> (TRIPS Agreement) states that sanctions of member countries must include imprisonment and / or fines, such to be an instrument of deterrence, consistently with the level of penalties applied for crimes of appropriate seriousness. In appropriate cases, remedies must also include the seizure and destruction of goods which infringe on the right, the materials and resources used in producing these goods.

The fear of criminal prosecution and punishment, following the effective completion of the preliminary investigation, acts preventively, averting a potential perpetrator from committing the offense. The laws relating to the protection of certain intellectual property rights include penalties for those who take actions provided for the violation of these rights.<sup>14</sup> It is necessary to emphasize the economic importance of criminal law protection because it provides better placement, and use of the right protected product, which guarantees the economic interest and success in business operations.

Criminal offenses against intellectual property can be found in Chapter XX of the Criminal Code of the Republic of Serbia, which includes the following offenses: violation of moral rights of authors and performers (Article 198) Unauthorized use of copyrighted works or objects of related rights (Article 199) Unauthorized removal or alteration of electronic information on copyright and related rights (Article 200), violation of patent rights (Article 201) Unauthorized use of design (Article 202).

Criminal offenses relating to intellectual property, can be found in the group of crimes against the economy, Chapter XXII, which are criminal offenses: unauthorized use of another's business name and other specific designation of goods or services (Article 233) and Disclosure of trade secrets (Article 240).

As it is well known, computer data falls under copyright protection, so the justification of intellectual property protection is recognized in Chapter XXVII of the Criminal Code of the Republic of Serbia, relating to offenses against the security of computer data. This group provides the following offenses: Damage to computer data and programs (Article 298); Computer sabotage (Article 299); Creating and introduction of computer viruses (Article 300) Computer fraud (Article 301) Unauthorized access to a protected computer, computer network and electronic data processing (Article 302); Prevention and restriction of access to a public computer network (Article 303). In comparative law, in response to the massive violations of intellectual property rights and increasing economic damages that result from them, there is a tendency of strengthening the criminal protection in terms of widening the circle of the actions, tightening of sanctions (even over 10 years in prison in the most severe cases) and liabilities of public Prosecutor to prosecute *ex officio*.<sup>15</sup>

12 Besarović Vesna; Intelektualna svojina, industrijska svojina i autorsko pravo, Čigoja štampa, Beograd, 2000, p.23.

13 The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) is an agreement between all member states of the World Intellectual Property Organization. Effective from 1 January 1995

14 Tanjević, Nataša; Krivičnopravna zaštita prava intelektualne svojine u Srbiji; Bezbednost br.1, Beograd; 2011; p.145

15 Marković Slobodan, Popović Dušan; Pravo intelektualne svojine; Pravni fakultet Univerziteta u Beogradu; Beograd; 2013; p.275



## POLICE ROLE IN PROTECTING INTELLECTUAL PROPERTY RIGHTS

According to The Development Strategy for intellectual property rights for the period from 2011 to 2015, the system of sanctions for infringements of intellectual property consists of two main segments: administrative (police, inspection, customs and Republic Broadcasting Agency) and forensic prosecution. In addition to taking care of the execution of its jurisdiction, the efficiency of both these segments depends not only on internal coordination and cooperation, but also the relationship with the Institute in order to exchange information and expertise. When we talk about the cooperation of the police with the Intellectual Property Institute, it is seen primarily in vocational education and informing, which is achieved by holding various seminars.

From seminars held in recent years in the organization of the Intellectual Property Institute of Serbia, attended by the members of the Ministry of Internal Affairs, we can mention: advanced training on counterfeit medical products; training on basic and advanced levels, where the police enriched their knowledge and experience by lectures on intellectual property, as well as cases from the practice of other European countries in order to improve the efficiency of enforcement of intellectual property rights, and stronger mutual cooperation of competent authorities, seminar on crime in the area of intellectual property which was hosted by Interpol, together with the European Patent Office.

Responsibility for the protection of intellectual property in the field of police in the Republic belongs to the Criminal Police. Two organizational units dealing with this issue have been specialized, and they are Department for Fighting Fraud and intellectual property protection within the Department for Fighting Economic Crime and the Department for crime prevention in the area of intellectual property rights within the Department of fight against cyber crime. If it were necessary to classify the types of actions to fight intellectual property rights infringements, Department for fighting fraud and intellectual property protection has been dealing with producing and marketing of pirated goods, while the Department for crime prevention in the area of intellectual property rights has been dealing with jeopardizing of intellectual property rights by using computers and computer network. As for providing this type of care at the regional police departments, the responsibility for this issue falls under the competence of the Department of Economic Crime.

According to the part of the Bulletin of the Ministry of Internal Affairs of the Republic of Serbia, which refers to the scope and jurisdiction of the Department of fight against cyber crime it is necessary to prevent infringement of intellectual property rights (to raise the level of investigation when violating the

intellectual property rights by using R2R network, FTP servers, Internet forums, websites and services, social networks in offenses related to the abuse of intellectual property rights such as advertising and distribution of "pirated" computer programs, eBooks, computer games, films, music and other audio-visual content) and other forms of offenses in the field of cyber crime that can be made under the foregoing offenses against intellectual property rights (the spread of computer viruses by downloading these contents, the performance of computer fraud, taking control over computers after entering computer viruses and carrying out other crimes such as preventing and restricting access to public computer network, etc.). What is necessary is to monitor and analyze P2P network, FTP server, internet forums, websites and services, the social network for illegal content and collecting physical evidence and clues in electronic form on the execution of crimes against copyright and related rights.

It is necessary to intensify activities aimed at identifying the contents which are the means of criminal offenses against intellectual property and focus attention on the people who use the Internet for advertising in order to sell goods that are counterfeit.

In many other countries, there is a police service that continuously and directly oversees Internet traffic, following the activities of bidders of goods or services on the Internet, participating in so-called chat rooms and discussions on blogs and so on. Thanks to these activities the police receive information about suspicious behavior, and resort to special measures of detection and investigation. Such a service doesn't exist in the Republic of Serbia. It is therefore necessary to broaden the jurisdiction of this activity at the Department of fight against cyber crime, regardless of the meager resources that may be initially invested in it.<sup>16</sup>

<sup>16</sup> Strategija razvoja intelektualne svojine za period od 2011 do 2015; Na osnovu člana 45. stav 1. Zakona o Vladi („Službeni glasnik RS”, br. 55/05, 71/05 – ispravka, 101/07, 65/08 i 16/11)

As for the duties of fighting economic crime, or the Department for Fighting Fraud and intellectual property protection, it is necessary to vigorously fight against crime in the area of production, trade, or otherwise unauthorized use of intellectual property, especially copyright and related rights in the field of publishing, music and film production and computer software, since in the so-called pirate production taxes and other obligations are avoided to the detriment of the society, and also the provisions of the Law on Copyright and Related Rights Act, Law on Cinematography and other regulations governing this matter are violated. Also, take measures to prevent and detect the manufacture, importation and sale of counterfeited products, as well as other crimes infringing industrial property rights (patents, trademarks, designs, trade secret, geographical indication of origin, topographies of integrated circuits, etc). Take preventive measures through cooperation with companies dealing with the legal importation of goods which contain the subject of copyright and related rights or industrial property rights.<sup>17</sup>

Lately, it has been observed that in the territory of the Republic of Serbia, a large number of people in a number of facilities perform illegal activities in the field of intellectual property. The data show that only in recent years, counterfeiting and piracy in our country have had serious consequences, including the death of several people. The public is aware that early in 1998 forty-three people died, and dozens had health damages caused by grape brandy labeled as "Lozovaca" which contained methyl alcohol intended for the chemical industry, and was made in "Zoja" from Nis. Also, in 2005 counterfeited vaccines against tetanus appeared in our market. The same thing happened in October 2007 when 93 patients received distilled water instead of a vaccine against tetanus.<sup>18</sup> In this way, in addition to avoiding tax and other duties, there is violation of law and a significant amount of damage to the community. It is an undeniable fact that in this area there is a large number of persons engaged in the commission of these crimes and at the same time they generate large incomes which are not registered for tax.

The fact, that in this area income is generated, but not taxed, either through sales tax, income tax, tax on wages of employees, taxes on profit, indicates the formation of huge damage, not only to the distributors and owners of copyright and related rights, but also to the budget of the Republic of Serbia which has been deprived of a significant amount.

It is important to point out the problem of piracy stratification manifested through various levels of forms, such as the organized production of optical compact discs on sophisticated devices for replication, multiplications on computer recorders, import and sale of pirated products in legally registered shops, sale in unregistered facilities and street selling online, selling through ads, telephone ordering, unauthorized copying and multiplication of book publications, unauthorized renting of discs, unauthorized film showing through cable television systems and through private TV stations, renting of pirated compact discs with software and computer games in clubs, game rooms ...<sup>19</sup>

As for the police acting aimed at preventing, fighting and proving criminal offenses against intellectual property, it begins with organizing actions and sudden controls in order to determine the facts and take appropriate measures. Information is collected by operational work and performance of common activities of police officers. Uniformed police officers and traffic police officers, performing their regular and patrolling activities, are obliged to keep and give in charge of the police the persons caught in the commission of crimes in this area, for further processing, as well as all the objects and means of perpetration, and to legitimize people who can provide information important for criminal proceedings and to prepare detailed official report which will be submitted for further competence.

When we talk about regional police departments, actions in fighting this form of criminal activity are generally initiated by the Department of Criminal Police which, by dispatches, calls the attention of regional departments to the complexity of these issues and points to the need to intensify prevention of crime in the area of intellectual property. Accordingly comes the obligation of regional police departments to report Department of Criminal Police on the undertaken actions, the number of officers involved, control of objects and persons, temporary seizure of objects, cooperation with other state authorities, and so on. All available notifications and other information, primarily related to individuals and companies engaged in the production and dis-

17 Information Booklet of Ministry of Internal Affairs of the Republic of Serbia

18 Zoran Miladinović, *Pravo intelektualne svojine*; Pravni fakultet univerziteta u Kragujevcu; Kragujevac, 2009, p.7

19 Information Booklet of Ministry of Internal Affairs of the Republic of Serbia

tribution of cases of offenses against intellectual property rights are submitted, with the aim of fighting illegal activities in this area. Often, an integral part of the dispatch is the note that indicates the tolerance of police officers on this case and the necessity of disciplinary punishment of these officers in order to build professional conduct and to prevent further ignoring of these criminal actions.

In order to fight the threats to intellectual property and destructive factors that accompany this distinction successfully, it is necessary to systematize existing information and collect new operational and other information on illegal activities. The goal of operations is collecting information and all relevant data about the perpetrators and organizers of these crimes, places and points where they are performed and manners of perpetrations.

It is necessary to take all preventive and repressive actions against these crimes that in the future should be treated with no tolerance, take legal measures towards all offenders, in particular unauthorized use of copyright and related rights and criminal acts that are performed in conjunction with this offense, and perform detection of crime in this area with mandatory seizure of all criminal subjects and resources for perpetration, the filing criminal charges against the perpetrators, and in cases where the legal requirements are met, undertake legal authority of detention, or the measures of retention. The following table contains the number of criminal charges of crimes against intellectual property rights for the period 2006 to 2012 in the territory of the Republic of Serbia.

Year	Total	Total offenses against the security of computer data	STRUCTURE				Total crimes	STRUCTURE		Unauthorized use of another's business name	Disclosure of trade secrets
			Damage to computer data and programs	computer sabotage	Computer fraud	Unauthorized accessing to protected comp. network		Infringement of moral rights	Unauthorized use of copyright works		
			ART.298	ART.299	ART.301.	ART.302		ART.198	ART.199		
'06	781	5		2	2	1	703	3	700	73	
'07	556	5		2	1	2	435		435	116	
'08	355	17	1		12	4	330		330	37	1
'09	268	4			1	2	212		212	52	
'10	285	33	1	1	30	1	216		216	33	3
'11	205	14	1	3	2	8	152		152	35	4
'12	174	11	1	1	3	6	129		129	33	1

*Table No.1 The structure of criminal charges of crimes against intellectual property<sup>20</sup>*

Starting from the data in table No.1 we can see that the highest number of criminal charges is for the criminal offense of unauthorized use of copyrighted works or objects of related rights (Article 199 CL) and therefore attention should be focused on operational work relating to the vendors, and the organizers of the production of unauthorized reproduction and distribution of pirated copyright works in the publishing, music and film production, computer software and computer games, as well as computer equipment vendors who sell or install illegal business software, and the people who perform editing (hosting) Internet domain through which they sell pirated products or perform unauthorized placement of copyright works on the Internet domain in order to enable the transfer (download) of such content to the memory of personal computer users.

<sup>20</sup> Data from the Ministry of Justice of the Republic of Serbia

It is necessary to check to determine whether there is an agreement on rental right, which was concluded between the copyright owner and the people who use it, and for how long the contract was

concluded and for how many copies of copyright work, which means that if there is a contract it can be

determined that there are more copies than the number specified in the contract and so there are elements of the offense. Also during the criminal investigation, it is necessary to pay attention to whether the contract or other document is genuine. It is important to determine whether the perpetrator put the author's work on the market or tried to put it on the market, and whether it is a copyright work or object of related rights. It is established if he possesses a large number of copies of the same copyright work, whether he advertises sale, whether he advertises for sale on the Internet, whether he has records of sales, customers, internal records of turnover, whether he has catalogs with titles of copyright works, etc...

In order to fight effectively against the abuse of intellectual property rights, it is necessary to obtain a warrant for the search of the apartment and other premises of all persons who are suspected of engaging in unauthorized copying, selling, storing or otherwise participate in the commission of offenses in this field. It is necessary to carry out a search of the suspect, his vehicle, or inspection of the vehicle in order to find the subjects of an offense and then temporarily seize them. The items that need to be seized during the search can involve non-recorded discs that are present at the crime scene, but which are intended for recording the contents of copyright work, computer equipment which is designed to connect computers and computer networks to the Internet, mobile phones, electronic directories, business cards, internal records, notebooks and other paper documents with the records of sale, reproduction or other activities associated with crime, and so on. It is essential to take care of the seized equipment, so that no treatment of the subjects of the crime during the seizure and provision does not lead to changes in its content. Analyzing the content must be carried out by a competent expert. Tactically, it is desirable to disable the people who happen to be in the premises during the search, to contact the equipment, to establish control over the object and to take the persons away from the computer. It is also necessary to photograph the premises and the condition of the equipment, as well as video documenting in order to gather evidence.

It is necessary to temporarily seize purchased or rented items from the citizens who were caught in the purchase or renting the pirated products, and then deliver them the invitation for gathering information about the offense and the perpetrator, or the person who sold or rented them the subject of an offense and collect all other information that may be of importance for the conduct of criminal proceedings, and if necessary, perform the action of recognition of the perpetrator.

Although the contribution of police action in order to protect the intellectual property is immeasurable, it is important to establish cooperation between the police and inspection, the Customs and Tax Administration. It would be desirable to establish a coordinating body for cooperation, establish a system for the statistical monitoring of repression and sanction of threats to intellectual property, as well as a program of cooperation between the police, customs, inspection, courts, prosecutors and the Intellectual Property Institute, and all authorities having jurisdiction over the field.

## CONCLUSION

Intellectual property has been brought into focus of the economic and legal sciences because of the development of information technology and the increasing number of innovations, regardless of whether they are simply a tool or a sophisticated invention. It is well known that investment in intellectual capital and encouraging innovation will have, as a result, economic progress and economic growth of the countries; therefore, the impact of the creation of the human intellect on the development of international economic and trade relationships must not be ignored. The importance of intellectual capital is immeasurable and protection must be implemented at all levels and by all the authorities that are responsible for the enforcement of intellectual property rights in the Republic of Serbia.

Starting from the fact that abuses occur in proportions that are almost imperceptible, to assume the proportions of the elements of organized crime, there must be established mutual cooperation and exchange of information both at national and international levels of competent authorities in this area. The lack of protection causes a loss of income at different levels. Countries investors lose interest and there is no direct foreign investment, so that has destructive impact on the balance of payments of the country. Prosecution includes the most effective methods to fight the infringement of intellectual property rights, as criminal law itself contains heavier penalties than any other protection mechanisms, as well as the threat and reality of imprisonment. Although the protection in the Republic of Serbia gets positive reviews at the level of regulations and the theoretical protection, it is necessary to improve the protection that goes beyond theory, and practically, energetically fight against crime in the area of production, transport, distribution, storage or any other form of abuse of intellectual property rights, and especially copyright and related rights.

A significant contribution of the activities of the police in the fight against violations of intellectual property rights is an undeniable fact. This phenomenon is so complex, so within the Ministry of Internal Affairs there are organizational units specialized in fighting criminal activities in this area, because it itself requires specialized expertise and professional knowledge. In order to find persons engaged in criminal activity, preventing the commission of further criminal activities, police have taken appropriate measures and actions, also temporarily seize objects that are suspected to be the subjects of the crime, arrest the perpetrators, collect information, all that in order to collect evidence for conduction of effective criminal proceedings.

Human and material resources that are used for the purpose of fight against criminal activity in this area, affect the results of the police. Results are visible and significant, but there is no doubt that greater investment in prevention of illegal activities related to intellectual property would cause extremely positive results, without the risk to the profitability of the investment. Since it is certain that there will be no such investment in the future, the effectiveness of police activities in anti-criminality in the area of intellectuals property right can be improved by better coordination with other government agencies that are engaged in the protection of intellectual property.

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## SOFTWARE PIRACY AS A FORM OF HIGH TECH CRIME AND MEASURES FOR ITS PREVENTION<sup>1</sup>

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**Abstract:** All countries in the world have a major's interest to provide an adequate protection of intellectual property, especially of copyright and related rights. We live in a period where counterfeiting and piracy have achieved epidemic proportions with tremendous detrimental effects on the world economy. This paper analyzes one of the most significant and most present forms of piracy characteristic for the cyber environment – the software piracy. Also, the paper gives an overview of the measures that have been adopted at the international level in order to prevent these negative effects, as well as highlights of Serbia, which is trying to catch up with international standards in this area.

Piracy is a relatively old and harmful social phenomenon that exists since the earliest times. Along with the development of intellectual creativity various forms and aspects of unauthorized use of other people's products of spiritual creativity were created and developed. Today, with the development of information technology, piracy is becoming pervasive and is becoming an increasingly important social problem. The digital environment is fertile ground for the flourishing of piracy. New technologies allow for quick, easy and inexpensive reproduction of copyright and cases of related rights. Internet allows very easy access to intellectual creations and to various forms of unauthorized dealing with it. Add to that the fact that a digitally reproduced (copied) copy is identical to the original, then hopes to respect intellectual property rights are quite illusory while expectations of good faith users of others' intellectual creations are complete illusion. We are witnesses to daily presence of the term piracy, which is related to different areas of human activities.

With the development of science and technology new media for the transmission and storage of information are created and the illegal exploitation of works that are protected by copyright achieve even greater proportions. Along with the development of the Internet and increasing users on the network, the unauthorized copying has begun to cause a growing problem.

**Keywords:** Piracy, Software, Intellectual property, Internet.

### INTRODUCTION

The problem of protecting Intellectual property rights in the world becomes more important every day. The interest the states achieve by giving protection to creators is undeniable.

On the one hand, the state encourages creativity by developing in individuals awareness on the cost-effectiveness of their works, and on the other hand, by stimulating economic development and raising revenue in taxes.

A person who is the subject of Intellectual property protection is typically a titular of subjective rights that authorize him exclusively to perform certain works with respect to protected Intellectual property<sup>2</sup>. Other persons can legally use other people's intellectual creations if the right holder consent is available. However, we are witnesses to the fact that due to the amazing developments in technology and the increasing role of information in 21 century, holders of Intellectual property rights are increasingly victims of unauthorized use of their protected rights.

In fact, at the time of inception of copyright as a separate legal discipline, it had the task to

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<sup>2</sup> D. Popović, *Isključiva prava intelektualne svojine i slobodna konkurencija*, Faculty of Law, University of Belgrade, Belgrade, 2012, p.12.

regulate the subjective copyrights concerning their works that were materialized in the classical, and/or analogue form. It is the form in which these works were expressed that significantly hampered unauthorized use or abuse in relation to their multiplication.

However, in cyberspace, copyright experienced tremendous changes and serious challenges were put in front of it because the structure of copyright works and methods of exploitation were changed. Unauthorized use of copyright works and objects of related rights became even more massive due to the impact of new digital technologies. Namely, the expansion of science and technology led to the development of new media for transmission and storage of information<sup>3</sup>. These are primarily related to the works expressed in digital form since there are unlimited possibilities for their massive unauthorized copying and subsequent distribution<sup>4</sup>.

## TWENTY-FIRST CENTURY CHALLENGE: DIGITAL TECHNOLOGY AND INTELLECTUAL PROPERTY RIGHTS PROTECTION

Piracy is reality of the modern world, while the level of protection that specific states provide to copyright and related rights holders is an image of the economic system and legal stability of a country. Investors estimate the eligibility of a country for foreign investments in its economy mostly by the level of protection enjoyed by holders of Intellectual property rights.

No wonder that piracy, particularly software piracy assumed epidemic proportions in the Third World, and even most developed countries did not remain immune<sup>5</sup>.

There is no doubt that the development of new digital technologies creates new forms of using works through digital networks.

However, despite the positive effects, digital technology has its other side, which refers to the easy access to content, easy content storage and cheap production of unauthorized copies of copyright works and objects of related rights.

Development of Information Technology affected the increase in the number of crime forms related to the area of high technology (cyber) crime. Mostly the states that have well-developed information structure recognized the danger of this type of crime and marked it as one of the most damaging<sup>6</sup>. *Cyber crime* is a form of criminal behavior, where the use of computer technology and information systems is manifested as a crime scene, while a computer or computer network are used as a performance tool or objective.

One of the types of crimes that occur within the high tech crimes are offences related to the infringement of copyright and related rights, which include the reproduction and distribution of unauthorized copies of computer system works<sup>7</sup>.

Digital technology has a much bigger impact on the authors' works presented in digital form, expressed in terms of works exploiting that may lead to an unauthorized use and abuse.

As for the author's works in a conventional form, they have a different status in digital environment, primarily because they can not be exploited in digital environment in a massive and uncontrolled form, or this exploitation is caused by using additional efforts<sup>8</sup>. Free circulation of certain copyright works and objects of related rights, specially computer programs, musical and film works in a modern information society leads to unauthorized use and abuses. Reasons for the unauthorized use of copyright works and objects of related rights are different: high profitability, the availability of cheap technology and equipment for producing pirated goods, the user's location, the economic stability of a country and the lack of adequate legal protection.

3 G. Dutfield, U. Suthersahen, *Global Intellectual property Law*, Northampton, 2008, p. 74.

4 Among theorists, there are different views on the future of copyright in cyberspace. There are those among them who predict that copyright will become a victim of digital technology and it will be its end.

For more details see: B. Spasić, *Autorska dela u digitalnom okruženju*, Faculty of Law - Nis, University of Nis, Nis, 2011. p 90 .

5 Review of top 20 economies based on data on the commercial value of pirated computer software in 2011 is available on the website: [http://globalstudy.bsa.org/2011/downloads/study\\_pdf/2011\\_BSA\\_Piracy\\_Study-In\\_Brief.pdf](http://globalstudy.bsa.org/2011/downloads/study_pdf/2011_BSA_Piracy_Study-In_Brief.pdf)

6 For more information on computer crime see: S. Petrović, *Kompjuterski kriminal*, Ministry of the Interior Editorial Office of *Bezbednost Magazine*, Belgrade, 2000, p 33-46..

7 One of the most important system of classifying high tech crime is given in the Council of Europe Convention on Cybercrime.

8 V. Spasić, *Autorska dela u digitalnom okruženju*, Faculty of Law - Nis, University of Nis, Niš, 2011. p. 88.

One of the most common forms of piracy today is the piracy of computer programs which damages rights holders<sup>9</sup> tremendously.

Piracy of computer programs is unauthorized copying of computer programs – copyright protected software. Most users realize that this is wrong, but there are those who do not accept the importance of the fact that the same software itself is a valuable Intellectual property. What some individuals do not consider when buying software is that they do not buy the software itself, but only the license to use the same - if more copies are made than the license anticipated then that very act is considered as piracy. The term software piracy dates back in the seventies of the previous century and was usually applied to the theft of software that was intended for sale in the market. Basically, software is a precious commodity. Using programs such as Auto Cad, Microsoft's server software and other cost much. Therefore, software industry claims that, due to piracy, it loses about fifteen billion dollars annually, and most of these losses are related to the use of unlicensed copies in the companies' internal networks, as well as to the organized counterfeiting in Eastern Europe and Asia.

Business Software Alliance (BSA) is the leading organization dedicated to promoting safe and legal *online* environment. It was founded in 1988, and its primary goal is to raise awareness and educate the public about the copyrights of software, IT security, e-commerce and other *Internet*-related issues. It is active in more than eighty countries around the world and in Serbia since 2002. Some of the BSA members include: Adobe, Apple Computer, Autodesk, Compaq, Dell, IBM, Intel, Macromedia, Microsoft, Novell and many others.

BSA annually commissions a Global Study on the level of piracy in the world from the International Analyst Agency for Information Technology, International Data Corporation (IDC). Since it has been made for years, this Global Study provides the software piracy itself to be the most researched form of piracy. Methodology for development of this Global Study is based on estimating how many software units have been installed on personal computers in one country, and this number is compared with the number of computer programs that companies delivered.

Data related to the Global Study on software piracy in 2011 showed that global piracy rate is 41%, that is 1% higher compared to 2008<sup>10</sup>. In the EU, the software piracy rate was about 33% (that is 2% less than in the past few years), in the U.S. it was 19%, while the Global Study in 2011 demonstrated that the highest rate of software piracy was in developing countries.

Despite the undisputed efforts of software vendors and governments to stop the illegal use of computer programs, this is still a huge problem that obstructs economic progress. Only in 2011 losses suffered by companies that were engaged in software production exceeded the figure of 63 billion U.S. dollars. By raising awareness about the negative financial and operational impact that companies and individuals that use unlicensed software have been faced with, BSA strives to achieve an increase in the use of licensed software. This organization, also, in cooperation with its members, tries to crack down on pirates.

Thus, for example, BSA, in cooperation with the U.S. software company *Microsoft* hired Professional *Cyber* Investigators and established an Operational Unit engaged in finding and destroying pirate groups. More than two million pirate websites offer unlicensed software compilations, usually by direct *download* from their servers, and this Unit on average "cracks" three hundred per month. "Grab a Site" tool is used in their business and is intended for downloading the whole site to their computer, and during this activity all files are marked by date and time to prove in the court that the website with illegal content really existed at the time.

When it comes to pirate websites that do not offer *download* material directly from the server but sell software discs, this trace is passed to the Team whose members act as potential customers and order discs that are to be used later as evidence in court proceedings. Therefore, the main task of this Unit is to prevent piracy by *websites* and notify the Internet service providers when the space on their server is misused<sup>11</sup>. In this way they harm pirates and obtain information that could be used in court proceedings.

However, with the development of *Internet* and increase of *websites*, it is clear that this Unit with the existing low capacity can not adequately respond to this complex, global problem.

9 For more information on the legal protection of software see: S. Radovanović, *Ugovor o licenci softvera*, Faculty of Law, University of Belgrade, Belgrade, 2012, p. 10-37.

10 Available at [http://portal.bsa.org/globalpiracy2011/downloads/study\\_pdf/2011\\_BSA\\_Piracy\\_Study-InBrief.pdf](http://portal.bsa.org/globalpiracy2011/downloads/study_pdf/2011_BSA_Piracy_Study-InBrief.pdf)

11 A. Vasić, *O odgovornosti internet servis-provajdera prema američkom pravu i pravu u EU*. Available at : NBP: Journal of Criminology and Law, Belgrade, 2011, No.3. p. 106.

## PROTECTION OF INTELLECTUAL PROPERTY RIGHTS UNDER INTERNATIONAL REGULATIONS

Protection of Intellectual property varies from country to country. In developed economies, Intellectual property holders have a higher degree of protection since developed countries, as technology exporters, conform with a relatively high degree of protection. On the other hand, developing countries, on pretext that it is in the national interest, provide a lower level of protection and in case of certain injuries they do not provide legal protection to the holders. In the early 1980s, a rapid growth of all forms of piracy was observed, which began to affect all sectors of International trade and the Member States of the International community sought harmonization and unification of legal rules to achieve protection of Intellectual property rights.

World Intellectual Property Organization – WIPO<sup>12</sup> has made significant efforts to suppress piracy by adopting various International regulations. However, the effects were not satisfactory, since WIPO does not provide the imposition of sanctions against Member States or individuals for non-compliance with its rules<sup>13</sup>. WIPO works closely on protecting Intellectual property rights with the World Trade Organization - WTO, that requires from its members to prevent piracy through their National Legislation, and unlike WIPO, may impose sanctions.

By developing the concept of Intellectual property and the expansion in this area, the need for harmonization of national legislation grew, and it is, by now, most comprehensively done at the WTO level. Namely, in addition to the Agreement on establishing the World Trade Organization, four Annexes were signed in 1994 which together constitute the Final Act of the Uruguay Round of GAAT, where Annex 1C of the Agreement on the WTO is the Agreement on Trade-Related Aspects of Intellectual property rights- TRIPS. Nowadays, TRIPS is the most important source of legislation that is applied to the entire field of protecting Intellectual property rights since it obliges all Member States of the WTO to provide, by their national legislation, the adequate protection of Intellectual property rights, which implies not only making valid legislation on all forms of Intellectual property rights protection that would be based on standards of protection prescribed by TRIPS, but also the implementation and practical enforcement of adopted regulations. Member countries of the WTO by adopting the Agreement on establishment committed themselves to accept TRIPS<sup>14</sup> as well.

The most important achievement of TRIPS is reflected in the fact that within the Intellectual property right certain principles that are basis for other agreements in the WTO such as Clause on most favored nation and Clause on National Treatment were introduced. It should specifically be emphasized that TRIPS provides rules for resolving disputes that, due to piracy, arise in the International market. It also provides a compulsory mechanism for introducing trade sanctions to Member States for violating Intellectual property rights on its territory<sup>15</sup>. What is of particular importance in the field of protecting computer program, as a result of human creativity, is that TRIPS in its Article 10 guarantees that software will be protected as literary works under the Berne Convention<sup>16</sup>. WTO Member States are obliged to guarantee to authors of computer programs or their successors the right to authorize or prohibit the commercial rental to the public of originals or copies of their copyright works. The main objective of TRIPS is that Member States shall undertake all required measures and provide adequate protection from any violation to the rights holder, whether it is a domestic or foreign entity.

At the level of EU several directives have been issued that aim to provide better protection to the rights holders in the new digital environment. The most important is the Directive on the

<sup>12</sup> World Intellectual property organization – WIPO is a United Nations agency based in Geneva, its main goal is to improve the protection of Intellectual property rights in order to encourage creative activity, the preparation

and conclusion of new multilateral agreements in this field.

<sup>13</sup> V. Besarović, *Intelektualna svojina*, Faculty of Law, University of Belgrade, Belgrade, 2011, p. 387.

<sup>14</sup> For the sources of the WTO see more in: P. Cvetković, *Uvod u pravo svetske trgovinske organizacije*,

Publications Center, Faculty of Law -Niš, Niš, 2010, p. 47-56.

<sup>15</sup> For further information see: C. Correa, *Intellectual Property Rights, the WTO and Developing Countries: The TRIPS Agreement and Policy Options*. Capital & Class, 2005, p. 207-218.

<sup>16</sup> Convention on the Protection of Literary and Artistic Works adopted in Bern in 1886 laid the foundations for International copyright protection. The Convention has established the basic principles mandatory for all member states, where authors or copyright holders can refer to in the countries in which they are not citizens (principle of assimilation of members of the Berne Convention for the citizens, the principle of minimum rights, etc.).

harmonization of certain aspects of copyright and related rights in the informatics environment which guarantees rights that must be regulated by each member state and adapted to the digital environment<sup>17</sup>.

Previously mentioned the International Intellectual Property Alliance (IIPA), a Private Sector Organization established in 1984 in the United States in order to prevent the unauthorized use and misuse of copyrighted material, is of particular significance. It develops standards for the effective protection of copyright and other related rights (primarily computer software, music records, audio tapes, CDs, textbooks, reference and professional publications and journals) and/or prevents their unauthorized use and misuse<sup>18</sup>.

### CONTROL OF SOFTWARE PIRACY IN SERBIA

Starting with the provisions of TRIPS and EU regulations that prescribe measures to prevent piracy and counterfeiting, a more serious way to protect Intellectual property rights was adopted in our country after 5 October changes. It should be noted that at the end of the previous century the regime in Serbia openly supported piracy as a special form of "patriotism", while thanks to this "profession" lots of pirates grew rich (there are data suggesting that software piracy in Serbia is more profitable than drug dealing).

The State Union of Serbia and Montenegro was included by the IIPA on the *Special Watch List* in 2003 because the scope of piracy exceeded 90%, and the failure to take necessary measures to combat this phenomenon particularly contributed to this.

After reviewing the situation in this area the IIPA in its Special Report no. 301 in 2003 presented recommendations of measures and activities that our Government had to implement urgently, such as: ratification of all international conventions governing this area, modifications of the Federal Law on Copyright and Related Rights Act in 1998, that should provide full protection and effective enforcement mechanisms of the law, the establishment of a special Government body that would combat piracy and ensure effective criminal investigations and court proceedings (by the Government decision the Commission for Combating Piracy was established in the same year), border measures to stop the import and export of pirated goods, closing newsstands, street stalls and other retail stores where piracy could have expanded, and training of Investigation and Prosecution Authorities in the matter of copyright protection. Serbia (together with Montenegro) was included in this report four times, on the so-called Watch list in 2003, 2004, 2005 and 2006.

It was only after publication of the Special Report No. 301 in 2003 when the efforts in the field of copyright and other related rights were accelerated to, finally, start something from a standstill - a legal framework for combating software piracy was created: in 2004, a new Law on Copyright and Related Rights<sup>19</sup>, the Law on Organization and Jurisdiction of Government Authorities in combating cyber crime (2005)<sup>20</sup> and the Law on Special Powers for effective protection of Intellectual property rights (2006)<sup>21</sup> were enacted. In addition, in April 2003, The National Assembly of the Republic of Serbia adopted the Law on Amendments to the Criminal Code<sup>22</sup> which, among other things, introduced a new group of criminal acts "Criminal acts against the security of computer data" and significantly expanded the area of criminal offence incrimination - Unauthorized use of copyright and other related rights.

With the mentioned amendments to the Criminal Law, criminal offence of unauthorized use of copyright and other related rights were classified as criminal offences prosecuted ex officio and the competent public prosecutor was obliged to initiate criminal proceedings against the perpetrator of this act.

In the mentioned Special Report No. 301 IIPA insists that the scope of the criminal -legal protection in this area is such that prosecution must be ex officio, and not as private action; po-

17 For more information see: V. Spasić, *Prilagodjavanje autorskog i srodnog prava informatičkom okruženju*, Journal of Faculty of Law- Niš; The Law of the Republic of Serbia and EU law, 2009, Volume II, p.571-589.

18 The State Union of Serbia and Montenegro was included in the special Watch list by the IIPA in 2003 because the volume of piracy exceeded 90%, and failure to undertake necessary measures to combat that phenomenon particularly contributed to this.

19 "Official Gazette of Serbia and Montenegro", No. 61/2004

20 "Official Gazette of the RS", No. 61/2005

21 "Official Gazette of the RS", No. 46/2006

22 "Official Gazette of the RS", No. 67/2003



tential punishments should not be symbolic, but must be strict in order to discourage potential perpetrators, criminal cases must be confiscated, taken away and destroyed in accordance with the law, and means for committing offences must be confiscated as well since it is based on the fact that the best effects in the fight against piracy and counterfeiting can be achieved just through the criminal – legal protection of Intellectual property rights. Most recent amendments to the Criminal Code in 2009 conformed the National Criminal legislation with the recommendations of the Convention on Cyber crime<sup>23</sup>. Criminal-legal protection has a special role in the protection of Intellectual property rights, which is also the most effective.

The Ministry of Internal Affairs of the Republic of Serbia is one of the most important factors in combating software piracy as a form of cyber crime. The Department for Combating Cyber crime was established in 2007 as a part of the Criminal Police; previously, Inspectors who were responsible for combating economic crime worked on combating piracy. The Department for Crime Prevention in the area of Intellectual property and the Department for Cyber Crime Prevention are within this Department.

It is essential that those involved in combating software piracy have certain knowledge about software licensing, know the Law on copyright and related rights, and to be technically equipped. Having all this in mind, the opening of this Department is very important.

The Law on Organization and Jurisdiction of Government Authorities in fight against cyber crime stipulated that the Special Prosecution Office for Cyber Crime should be responsible for dealing with cases involved in detection, prosecution and trial of offences against the computer data security. Since its establishment in early 2006 until October 2011 this Office handled and is handling 1700 cases within its jurisdiction, and 95% of them were related to Internet frauds, infringement of Intellectual property rights and security threats. However, the establishment of a new Judicial Network stipulated two Senior Deputy Prosecutors in Belgrade to be in charge of high-tech crime and responsible for the Republic of Serbia; it is reasonable to expect that it will be difficult to achieve efficiency from the past, because fewer people will be working on an increasing number of cases.

It is necessary to point out that in all bodies involved in combating software piracy there are IT educated people who know the issues and have the will to solve this problem. Nowadays, the situation with regard to combating software piracy is much better than a few years ago. Research results of BSA International study show that the software piracy rate in 2011 was reduced by 2%, while in other countries in the region, except Croatia, it stagnates. How important is this reduction in piracy is the fact that only ten countries in the world achieved such results and that is the best result in the region. Due to lower rates of software piracy, domestic software industry had growth of 1.5%, while based on the increase in software sales the budget revenue was 3.5 million €.

In addition, two hundred new jobs have been opened in the software industry.

There is no doubt that the establishment of the Department for Combating Cyber Crime at the Ministry of Interior and the Prosecution teams significantly accelerated the process of combating piracy and made the momentum laws rapidly spinning.

## CONCLUSION

Civilization Progress recognizes Information Technology as an inseparable part of our lives, and there must be willingness and determination to protect them from any abuse because of their importance, purpose and characteristics in every society.

Software piracy damages legal economy, inflicts damage to state budgets since pirated software products are sold on the black market; and huge amounts of money are acquired illegally thus violating the rights of creators.

In accordance with International Standards a set of laws on Intellectual property rights has been adopted in our country, which includes the rules that apply to combating software piracy. It is necessary to create more adequate conditions for implementation of these legislative acts in order to, in the best way, accomplish their purpose. It is also necessary to constantly work on educating Government authorities in order to qualify them for preventing and suppressing this type of cyber crime.

<sup>23</sup> Decision of the European Council adopted on 23 November 2001 in Budapest.

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**FEATURES OF CRIMINAL JUSTICE MEANS  
OF ECONOMY OF UKRAINE**

**ОСОБЕННОСТИ ПРИМЕНЕНИЯ УГОЛОВНО-ПРАВОВЫХ  
СРЕДСТВ ОХРАНЫ ЭКОНОМИКИ УКРАИНЫ**

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**Abstract:** Economic crimes cause damage to prosperity of the whole population of the state. A high quality counteraction to mentioned illegal acts requires versatile studies. Thereafter, the analysis of application by courts the criminal means of defence will indicate the expediency for setting specific penalties.

**Keywords:** economy, crime, article, penalty, fine.

Необходимо констатировать, что для решения поставленных в науке уголовного права вопросов кажется недостаточным акцентирования внимания лишь на теоретической основе. О потребности расширения сферы научного исследования указывала и Н.П. Ждиняк. Рассматривая вопрос соотношения понятий реализации и применения запрещающих уголовно-правовых норм, вышеуказанная ученая отмечала потребность изучения не только действующего законодательства, но и практики его применения судами и органами исполнения наказаний<sup>1</sup>.

**ВСТУПЛЕНИЕ**

Изучая явления реализации и применения запрещающих уголовно-правовых норм, Л.И. Спиридонов определял их как стадии действия нормы<sup>2</sup>. В частности, само действие закона автор рассматривал, как две стадии: первая – предупредительное действие юридического запрета, которое вынуждает человека воздержаться от совершения противоправных поступков; вторая – применение уголовного закона правоохранительными органами в том случае, если уголовно-правовой запрет все же нарушается [там же].

В целом, по общему признанию, каждая норма уголовного права по своему значению и содержанию назначена дать ответ на три основных вопроса:

- 1) когда следует руководствоваться данной правовой нормой?
- 2) какое именно поведение приписывается или разрешается как надлежащее этой правовой нормой участникам регулируемого отношения?
- 3) какие будут последствия для лица, которое нарушило предписание данной правовой<sup>3</sup>.

Стоит отметить, что ответ на указанные вопросы возможно получить из содержания уголовного закона, однако не выясняемым остается, какие именно последствия реально были применены к лицу, которое нарушило уголовно-правовой запрет? Важность последнего утверждения объясняется тем, что состояние преступности зависит не только от детерминант, которые способствуют совершению преступлений, но и от факторов, которые препятствуют осуществлению неправомερных деяний, одним из которых в частности является угроза применения наказания.

1 Ждиняк Н.П. «Реализация» та «застосування» забороняючих кримінально-правових норм: співвідношення понять – С. 305

2 Спиридонов Л.И. Социология уголовного права – С.126

3 Гіда Є.О. Теорія держави та права

Следовательно, получение ответа на последний вопрос кажется вероятным путем подсумирования следующих утверждений. Первое, наказание имеет целью не только наказание, но и исправление осужденных, а также предотвращение совершения новых преступлений как осужденными, так и другими лицами (ч. 2 ст. 50 УК Украины). Соответственно, второе, с момента вступления в силу запрещающая уголовно-правовая норма уже начинает действовать, поскольку именно от этого момента возможно ее предупредительное влияние на соответствующие лица. Однако, в случае, когда такое влияние не сработало и совершено преступление, из этого момента работники судебных и правоохранительных органов применяют запрещающую уголовно-правовую норму<sup>4</sup>.

Третье, применение норм права – это форма реализации норм права компетентными субъектами относительно решения конкретного дела, которое имеет государственно-властный, творчески-организационный характер, осуществляется в установленном процедурном порядке и завершается изданием правоприменительного акта<sup>5</sup>. Соответственно, четвертое, акт применения права – это индивидуальный правовой акт государственного характера, принятый компетентным органом в установленной законодательством форме, по конкретному делу, относительно конкретного субъекта и подтверждает, устанавливает, изменяет или прекращает его права, а также обязанности<sup>6</sup>.

Подытоживая, если в установленном законом порядке доказано, что лицо совершило преступление, то к нему применяется наказание, предусмотренное санкцией конкретного уголовно-правового средства. Однако санкция сама по себе автоматически не может привести к негативным юридическим последствиям относительно правонарушителя, а поэтому необходимо дополнительное действие государственного органа или должностного лица<sup>7</sup>. Соответственно, в рассматриваемом случае идет речь о вынесении судом обвинительного приговора относительно лица, которое совершило преступление и является актом применения права.

Следовательно, путем анализа приговора, возможно выяснить какие именно последствия реально были применены к лицу, которое нарушило уголовно-правовой запрет. Важность установления этой информации объясняется значением наказания, поскольку оно является пока что одним из существенных антикриминогенных факторов<sup>8</sup>. Неминуемое наступление сурового наказания выступает в качестве действенных мер предотвращения совершения преступления.

## АНАЛИЗ ПРИГОВОРОВ

Учитывая взаимозависимость диспозиции и санкции уголовно-правовой нормы, установление вида и размера назначенного наказания предоставит возможность определить особенность и целесообразность ее применения в целом. Следовательно, с целью выяснения очерченного в данном исследовании вопроса было решено целесообразным проанализировать по 20 приговоров в которых отмечена конкретная статья УК Украины что предусматривает уголовную ответственность за совершение преступления в сфере экономики. Для объективной оценки установления особенностей применения уголовно-правовых средств охраны экономики Украины определен часовой период 2012 и 2013 годов соответственно по 10 приговоров за каждый год.

В зависимости от определенной самим законодателем последовательности указания уголовно-правовых средств в УК Украины, при условии наличия приговоров, считается рациональным начать исследование от самого первого.

**Статья 114. Шпионаж.** Хотя за указанный период были вынесены лишь два обвинительных приговора, однако лишь один касался преступления, где объектом посягательства была определена национальная безопасность Украины в сфере экономики. Следовательно, было назначено одно наказание в виде лишения свободы на определенный срок, в пределах санкции ближе нижнего предела с реальным его отбыванием.

4 Ждиняк Н.П. «Реалізація» та «застосування» забороняючих кримінально-правових норм: співвідношення понять – С. 303

5 Гада С.О. Теорія держави та права

6 Т.Г. Андрусак Застосування правових норм

7 Гада С.О. Теорія держави та права

8 Рощина І.О. Структурні елементи норм кримінального права та їх ефективність у запобіганні злочинам – С.

**Статья 199. Изготовление, хранение, приобретение, перевозка, пересылка, ввоз в Украину с целью использования при продаже товаров, сбыта или сбыт подделанных денег, государственных ценных бумаг, билетов государственной лотереи, марок акцизного сбора или голографических защитных элементов.** В соответствии с содержанием приговоров были совершены 22 преступления, за которые назначены 22 наказания, из которых 1 штраф (4%) 1 общественные работы (4%) 1 ограничение воли (4%) 19 лишения свободы на определенный срок (88%). В пределах санкции 16 (73%) которые все без исключения ближе нижнего предела, а те что выходят за пределы составляют 6 (27%). Однако из назначенных наказаний лишь 6 характеризуются реальным отбыванием (27%), а 16 лишений свободы на определенный срок – освобождением (73%).

**Статья 200. Незаконные действия с документами на перевод, платежными картами и другими средствами доступа к банковским счетам, электронными деньгами, оборудованием для их изготовления.** За указанный период было лишь 6 обвинительных приговоров, в которых отмечено совершение 8 преступлений, за которые предусмотрена уголовная ответственность очерченной статьей. Следовательно назначено 8 наказаний, из которых 6 штрафов (75%) и 2 лишения свободы на определенный срок (25%). В пределах санкции 7 (87%) что ближе нижнего предела 5 (71%), а ближе верхнего – 2 (29%). Лишь одно наказание выходит за пределы санкции (13%). Однако из назначенных наказаний лишь 6 характеризуются реальным отбыванием (75%), а 2 лишения свободы на определенный срок – освобождением (25%).

**Статья 203-1. Незаконный оборот дисков для лазерных систем считывания, матриц, оборудования и сырья для их производства.** За указанный период было вынесено лишь 14 обвинительных приговоров, в которых отмечено совершение 14 преступлений, за которые предусмотрена уголовная ответственность очерченной статьей. Следовательно, назначено 14 наказаний, из которых 12 штрафов (86%) и 2 лишения свободы на определенный срок (14%). Размеры наказаний, которые находятся в пределах санкции, – 6 (43%), что ближе нижнего предела – 5 (83%), а ближе верхней – 1 (17%). 8 наказаний выходят за пределы санкции (57%). Необходимо отметить, что из назначенных наказаний 13 характеризуются реальным отбыванием (93%) и только одно лишение свободы на определенный срок – освобождением (7%).

**Статья 203-2. Занятие игральным бизнесом.** В соответствии с содержанием приговоров было совершено 20 преступлений, за которые назначено 20 наказаний исключительно в виде штрафа (100%). В пределах санкции 15 (75%) которые все без исключения ближе нижнего предела, а те что выходят за пределы составляют 5 (25%). Стоит отметить, что все наказания без исключения характеризуются реальным отбыванием (100%).

**Статья 204. Незаконное изготовление, хранение, сбыт или транспортировка с целью сбыта подакцизных товаров.** В соответствии с содержанием приговоров были совершены 42 преступления, за которые назначены 42 наказания, из которых 31 штраф (74%), одно ограничение свободы (2%) и 10 лишений свободы на определенный срок (24%). В пределах санкции 29 (69%) которые все без исключения ближе нижнего предела, а те что выходят за пределы составляют 13 (31%). Однако из назначенных наказаний 34 характеризуются реальным отбыванием (81%), а 8 наказаний в виде лишения свободы на определенный срок – освобождением (19%).

**Статья 205. Фиктивное предпринимательство.** В соответствии с содержанием приговоров было совершено 20 преступлений, за которые назначено 20 наказаний, из которых 19 штрафов (95%) и одно ограничение свободы (5%). В пределах санкции 19 (95%) которые все без исключения ближе нижнего предела, а то наказание, что выходит за пределы составляют 5%. Однако из назначенных наказаний лишь 15 характеризуются реальным отбыванием (75%), а 4 наказания в виде трех штрафов и одного ограничения свободы – освобождением (20%). Стоит заметить, что в связи с окончанием сроков давности имеется одно освобождение от уголовной ответственности (5%).

**Статья 209. Легализация (отмывание) доходов, полученных преступным путем.** За указанный период было вынесено лишь 17 обвинительных приговоров, в которых отмечено совершение 19 преступлений, за которые предусмотрена уголовная ответственность очерченной статьей. Следовательно, назначено 46 наказаний, из которых 17 лише-



ния права обнимать определенные должности (37%), конфискация имущества 10 (22%) и 19 лишений свободы на определенный срок (41%). Размеры наказаний, которые находятся в пределах санкции – 33 (72%) из которых ближе нижнего предела – 11 (33%), а ближе верхнего – 22 (67%). 13 наказаний выходят за пределы санкции (28%) Необходимо отметить, что из назначенных наказаний 39 характеризуются реальным отбыванием (85%) и 7 лишений свободы на определенный срок – освобождением (15%). Кажется целесообразным отметить, что больше всего наказаний в виде лишения свободы на определенный срок назначено именно за совершение рассматриваемого преступного деяния.

**Статья 210. Нецелевое использование бюджетных средств, осуществления расходов бюджета или предоставления кредитов из бюджета без установленных бюджетных назначений или с их превышением.** За указанный период было вынесено лишь 4 обвинительных приговора, в которых отмечено совершение 4 преступлений, за которые предусмотрена уголовная ответственность очерченной статьей. Следовательно назначено 6 наказаний, из которых 2 штрафа (33%), 2 лишения права занимать определенные должности. (33%) и одно ограничение свободы (17%). Все наказания находятся в пределах санкции ближе нижнего предела (100%). Все назначенные наказания характеризуются реальным отбыванием (100%).

**Статья 212. Уклонение от уплаты налогов, сборов (обязательных платежей).** В соответствии с содержанием приговоров было совершено 20 преступлений, за которые назначено 45 наказаний, из которых 14 штрафов (32%), 19 лишения права обнимать определенные должности (42%), 6 конфискаций имущества (13%) и 6 лишений свободы на определенный срок (13%). В пределах санкции 36 (80%) из которых ближе нижнего предела 16 (44%) и 20 ближе верхнего предела (56%). Выходят за пределы санкции 9 наказания (20%). Однако из назначенных наказаний лишь 36 характеризуются реальным отбыванием (80%), а 7 наказаний в виде одной конфискации имущества и 6 лишений свободы на определенный срок – освобождением (16%). Стоит заметить, что в связи с окончанием сроков давности имеются 2 случая освобождения от уголовной ответственности (4%).

**Статья 212-1. Уклонение от уплаты единственного взноса на общеобязательное государственное социальное страхование и страховых взносов на общеобязательное государственное пенсионное страхование.** За указанный период было принято лишь 2 обвинительных приговора, в которых отмечено совершение 2 преступления, за которые предусмотрена уголовная ответственность очерченной статьей. Следовательно назначены 4 наказания, из которых 2 штрафа (50%) 2 конфискации имущества (25%) и одно ограничение свободы (25%). В пределах санкции 3 (75%) из которых ближе нижнего предела 2 (67%) и 1 ближе верхнего предела (33%). Выходит за пределы санкции 1 наказание (25%). Однако из назначенных наказаний лишь 3 характеризуются реальным отбыванием (75%), а 1 наказание в виде штрафа – освобождением (25%).

**Статья 213. Нарушение порядка осуществления операций с металлоломом.** В соответствии с содержанием приговоров было совершено 20 преступлений, за которые назначено 20 наказаний, из которых 3 штрафа (15%) и 17 общественных работ (85%). В пределах санкции 18 (90%) из которых ближе нижнего предела 17 (94%) и 1 ближе верхнего предела (6%). Выходят за пределы санкции 2 наказания (10%). Стоит заметить, что совместно с ст. 203-2, при наличии 20 приговоров, это единственные случаи отсутствия освобождений от отбывания наказания.

**Статья 216. Незаконное изготовление, подделка, использование или сбыт незаконно изготовленных, полученных или подделанных контрольных марок.** За указанный период было принято лишь 12 обвинительных приговоров, в которых отмечено совершение 13 преступлений, за которые предусмотрена уголовная ответственность очерченной статьей. Следовательно назначено 13 наказаний, которые все в виде штрафа (100%). В пределах санкции 9 (69%) из которых ближе нижнего предела 8 (89%) и 1 ближе верхнего предела (11%). Выходят за пределы санкции 4 наказания (31%). Стоит отметить, что все наказания без исключений характеризуются реальным отбыванием (100%).

**Статья 219. Доведение до банкротства.** За указанный период было вынесен лишь 1 обвинительный приговор, в котором отмечено совершение одного преступления, за которое предусмотрена уголовная ответственность очерченной статьей. Следовательно, были

назначены 2 наказания в виде штрафа (50%) и лишения права занимать определенные должности (50%). 2 в пределах санкции (100%) что ближе верхнего предела (100%) с реальным их отбыванием (100%).

**Статья 222. Мошенничество с финансовыми ресурсами.** За указанный период было вынесено 19 обвинительных приговоров, в соответствии с которыми было совершено 20 преступлений. Соответственно назначено 29 наказаний, из которых 19 штрафов (66%), 9 лишений права обнимать определенные должности (31%) и 1 лишение свободы на определенный срок (3%). В пределах санкции 15 (52%) из которых ближе нижнего предела 11 (73%) и 4 ближе верхнего предела (27%). Выходят за пределы санкции 14 наказаний (48%). Из назначенных наказаний лишь 27 характеризуются реальным отбыванием (93%). Стоит заметить, что в связи с окончанием сроков имеются 2 случаи освобождения от уголовной ответственности (7%).

**Статья 229. Незаконное использование знака для товаров и услуг, фирменного наименования, квалифицированного указания происхождения товара.** За указанный период было принято 15 обвинительных приговоров, в соответствии с которыми было совершено 18 преступлений. Соответственно назначены 23 наказания, из которых 18 штрафов (78%) и 5 лишения права обнимать определенные должности (22%). В пределах санкции 14 (61%) из которых ближе нижнего предела 12 (86%) и 2 ближе верхнего предела (14%). Выходят за пределы санкции 9 наказаний (39%). Стоит отметить, что все наказания без исключений характеризуются реальным отбыванием (100%).

**Статья 233. Незаконная приватизация государственного, коммунального имущества.** За указанный период был вынесен лишь 1 обвинительный приговор, в котором отмечено совершение одного преступления с назначением 1 наказание в виде штрафа, который выходит за пределы санкции с реальным его отбыванием.

**Статья 306. Использование средств, добытых от незаконного обращения наркотических средств, психотропных веществ, их аналогов, прекурсоров, ядовитых или сильнодействующих веществ или ядовитых или сильнодействующих лекарственных средств.** За указанный период было принято 12 обвинительных приговоров, в соответствии с которыми было совершено 12 преступлений. Соответственно назначено 19 наказаний, из которых 7 конфискации имущества (37%) и 12 лишений свободы на определенный срок (63%). В пределах санкции 7 (37%) которые все ближе верхнего предела (100%). Выходят за пределы санкции 12 наказаний (63%). Однако из назначенных наказаний лишь 15 характеризуются реальным отбыванием (79%), а 4 наказания в виде лишения на определенный срок – освобождением (21%).

Стоит отметить, что с момента действия действующего уголовно-правового законодательства до сих пор отсутствуют обвинительные приговоры за преступные деяния, уголовная ответственность за совершение которых предусмотрена ст.ст. 111, 113, 206, 209-1, 211, 222-1, 223-1, 223-2, 224, 231, 232, 232-1, 232-2.

Следовательно, проанализировав 244 обвинительных приговора, в которых отмечено назначение наказания за совершение преступления в сфере экономики, кажется возможным указать следующие особенности применения уголовно-правовых средств охраны экономики Украины :

1. Уголовно-правовые средства по которым имеются случаи их применения – 18, а именно ст.ст. 114, 199, 200, 203-1, 203-2, 204, 205, 209, 210, 212, 212-1, 213, 216, 219, 222, 229, 233, 306 (58%);

2. Уголовно-правовые средства по которым отсутствуют имеющиеся случаи их применения – 13, а именно 111, 113, 206, 209-1, 211, 222-1, 223-1, 223-2, 224, 231, 232, 232-1, 232-2 (42%).

3. Среди назначенных наказаний:

- штраф – 49%;
- лишение права обнимать определенные должности – 16%;
- общественные работы – 5%;
- конфискация имущества – 7%;
- ограничение воли – 1%;
- лишение свободы на определенный срок – 22%.

4. Наказание в пределах санкции – 71%, среди которых:
  - ближе нижнего предела – 73%;
  - ближе верхнего предела – 27%.
5. Наказания, которые выходят за пределы санкции, - 29%.
6. Реальное отбывание наказания – 84%;
7. Освобождение от отбывания наказания – 15% среди которых:
  - штраф – 10%;
  - конфискация имущества – 2%;
  - ограничение свободы – 2%;
  - лишение свободы на определенный срок – 86%.
8. Освобождение от уголовной ответственности – 1%.

В целом задание уголовного закона прежде всего заключается в общей превенции, когда предупреждение рассчитано на неопределенный круг лиц. Уголовный закон в таком случае обеспечивает законопослушное поведение граждан, удерживает их от совершения противоправных действий<sup>9</sup>. Соответственно на законодательном уровне закреплено, что одним из заданий УК Украины есть предотвращение преступлений, которое осуществляется путем определения в нем, какие общественно опасные деяния являются преступлениями и какие наказания применяются к лицам, что их совершили (ст. 1 КК Украины).

Учитывая результаты проведенного исследования, наиболее распространенным видом назначенного наказания, при совершении преступлений в сфере экономики, есть штраф – 49%. В общем штраф не только в отечественном, но и в зарубежном уголовном праве давно уже стал классическим видом наказания. В современном мире нет ни одного уголовного кодекса, который бы не предусматривал этого вида наказания<sup>10</sup>.

В данном случае стоит отметить позицию В.В. Коваленка который считает необходимым оптимизировать практику применения наказания в виде штрафов за экономические преступления с целью установления адекватности такого наказания тяжести совершенного преступления, лицу виновного и обстоятельствам дела<sup>11</sup>.

В целом указанный автор, осуществляя исследование штрафа, как вид наказания за уголовным правом Украины установил следующие позитивные признаки его применения:

- эффективное влияние на преступника без применения к нему суровых мер, в частности лишение свободы;
- сокращение удельного веса лишения свободы в структуре уголовности преступлений и снижения уровня переполнения тюрем;
- отсутствие необходимости в специальной исполнительной системе;
- доходность для государственного бюджета [там же].

Безусловно штраф, как вид наказания само часто встречается в Разделе VII «Преступления в сфере хозяйственной деятельности», что подтверждает осознание законодателя относительно эффективности использования указанной меры принуждения за преступления совершенные в сфере экономики. Однако, имеются нормы, где тяжесть совершенного деяния не отвечает строгости примененному виду наказания.

В данном случае, с целью подчеркивания выше отмеченного, стоит воспользоваться на примере назначенных наказаний и их реальных отбываний. Хотя санкцией статьи и предусмотрен определенный вид наказания, однако если суд при назначении наказания, учитывая тяжесть преступления, лицо виновного и другие обстоятельства дела, придет к заключению о возможности исправления осужденного без отбывания наказания, он может принять решение об освобождении от отбывания наказания с испытанием (ст. 75 УК Украины). В частности, по отношению к рассматриваемой группе преступлений, это касается наказаний в виде лишения свободы на определенный срок, поскольку среди общего количества освобождения от наказаний они составляют 86%.

Стоит отметить и об особенной специфике субъектов преступлений в сфере экономики, образовательный, социальный и культурно-правовой уровень которых позволяет

<sup>9</sup> Коваленко В.В. Профілактика економічної злочинності в Україні: концептуальні засади, організаційно-правові основи, проблеми управління: монографія – С. 176

<sup>10</sup> Попрас В.О. Штраф як вид покарання за кримінальним правом України – С. 3

<sup>11</sup> Коваленко В.В. Профілактика економічної злочинності в Україні: концептуальні засади, організаційно-правові основи, проблеми управління: монографія – С. 183

выделить экономическую преступность как «элитарную». В частности одним из направлений деятельности современной пенитенциарной системы относительно установления социальной справедливости есть не только карательная функция, но и профилактика рецидива преступлений. Однако, в результате длительного пребывания в местах лишения свободы, негативного влияния окружающего криминогенного элемента – осуждённый за преступление в сфере экономики приобретает новые навыки и умения, которые будут способствовать продолжению совершения неправомерной деятельности в будущем.

Поэтому кажется сомнительным факт, что попадание данной категории субъектов преступлений в места лишения свободы будет способствовать достижению исправления осужденного лица и предупреждения с ее стороны совершения новых преступлений.

Со второй же стороны существует огромное количество примеров, когда после отбывания наказания (полностью или частично) лицо не чувствует себя наказанным, потому что в его распоряжении остаются дома, автомобили фирмы, значительные средства за рубежом и тому подобное. При этом государство и граждане остаются обманутыми<sup>12</sup>.

В связи с этим, рядом с вышеуказанными позитивными чертами штрафа считается целесообразным указать и его негативные стороны, а именно:

- невозможность его применения одинаковой степенью ко всем категориям населения в связи с его имущественным расслоением (существование альтернативы в виде лишения свободы и штрафа приводит к тому, что малоимущим осужденным назначается лишение свободы, а богатым - штраф);

- возможность замены штрафа лишением свободы, которая приводит на практике к тому, что за деяние небольшой тяжести лицо поддается лишению свободы<sup>13</sup>.

Вот почему в каждом случае суд при назначении наказания по каждому делу должен учитывать степень тяжести совершенного преступления, обстоятельства, которые отягощают или смягчают наказание, лицо виновного. Правильная квалификация преступления является необходимой предпосылкой индивидуализации наказания, поскольку лишь на ее основании возможно вынесение судом законного и обоснованного приговора, а следовательно и назначение справедливого и целесообразного наказания.

### СПОСОБЫ ОПРЕДЕЛЕНИЯ ЕДИНИЦЫ ИЗМЕРЕНИЯ ШТРАФА

Для окончательного решения вопроса относительно актуальности применения штрафа, как основного вида наказания за преступления в сфере экономики считается необходимым указать на способы определения единицы измерения такого вида наказания в соответствии с иностранными законодательствами.

В целом условно можно выделить три способа:

1. определяется в твердых суммах в национальной денежной единице соответствующей страны (Россия, Англия, Швейцария);

2. использование определенной условной расчетной единицы :

а) без учета размера доходов конкретного лица, которое совершило преступление: единицы так называемой “базовой величины” (Беларусь), минимальные заработные платы (Латвия), минимальные прожиточные минимумы (Литва), необложенный налогом минимум доходов граждан (Украина);

б) с учетом размера доходов конкретного лица, которое совершило преступление (Испания, Польша, Германия)

3. установление его в размере кратному размеру имущественного вреда, который причинен преступлением (в частности уголовным кодексом УССР в соответствии со ст. 84-1 назначалось наказание трехкратное размеру похищенного).

Учитывая отмеченное целесообразно также указать законодательство Германии в части возможности назначения судом выплаты штрафа частями. Зато за невыплаченный денежный штраф назначается лишение свободы с расчетом одна дневная ставка отвечает одному дню лишения свободы<sup>14</sup>.

12 Коваленко В.В. Профилактика економічної злочинності в Україні: концептуальні засади, організаційно-правові основи, проблеми управління: монографія – С. 184

13 Попрас В.О. Штраф як вид покарання за кримінальним правом України – С. 4

14 Малиновский А.А. Уголовное право зарубежных государств – С. 44

Подобная позиция отмечена и в отечественном законодательстве, в частности в 2008 году ст. 53 была дополнена ч. 4, которая предусматривает, что суд с учетом имущественного состояния лица может назначить штраф с рассрочкой выплаты по определенным частям сроком до трех лет, что дает основания утверждать об усовершенствовании уголовного законодательства, путем заимствования некоторых норм зарубежных государств.

Если сравнивать с уголовным законом Германии, то стоит отметить, что отечественный законодатель пошел несколько более гуманным путем, признавая возможность суда заменить неуплаченную сумму штрафа наказанием в виде общественных работ или исправительных работ. Однако расчет такой замены нуждается в немедленном изменении, поскольку десять часов общественных работ за один установленный законодательством необложенный налогом минимум доходов граждан или соответственно месяц исправительных работ – четыре установленных законодательством необложенных налогом минимумов доходов граждан в условиях нынешнего времени является просто абсурдными (состоянием на 01.01.2013 года размер установленного законодательством необложительно налогом минимума доходов граждан представляет семнадцать грн.).

Но если законодатель примет решение о приравнивании необложительно налогом минимума доходов граждан к налоговой социальной льготе (состоянием на 01.01.2013 года – 573 грн.) то минимальный размер штрафа вырастет с 510 до 17190 грн. – что не оказывается эффективным решением вопроса.

Поэтому учитывая нарушенную проблематику и опираясь на опыт зарубежных государств считается наиболее эффективным и оптимальным решением данной проблемы есть замена действующей единицы измерения штрафа. Стоит указать, что подобным путем пошло и русское законодательство, которое в 2003 году внесло изменения в уголовный кодекс в части замены минимального размера оплаты труда на русскую денежную единицу – рубль<sup>15</sup>.

Однако принимая во внимание негативные экономические процессы, что присущие не только нашему государству, но и целому миру (недавний мировой экономический кризис), нестабильность отечественной денежной единицы не дает оснований для целесообразности внедрения изменений единицы измерения штрафа на гривну. В данном случае уместным будет воспользоваться опытом Республики Польша и установить вместо необложительно налогом минимума доходов граждан дневные ставки с учетом материального положения лица и прибыли, которую данное лицо имело или могло иметь в среднем в день. Подобный способ определения единицы измерения штрафа присущ и немецкому уголовному законодательству.

Считается, что такое нововведение будет самым эффективным стимулом к воздержанию от совершения преступных действий со стороны «белых воротничков» как впервые, так и в будущем. В частности результаты анкетирования указывают, что в случае определения действующей единицы измерения наказания неэффективной, респонденты указывают на целесообразность ввода использования определенной расчетной единицы с учетом размера доходов конкретного лица, которое совершило преступление (74,2%). Соответственно лицо реально будет осознавать угрозу потери своих состояний.

По этому поводу В.И. Антипов отмечал, что логическим и необходимым этапом, который завершает работу правоохранительных органов, является рассмотрение уголовных дел судом, постановление приговора и назначение наказания. Если же в силу тех или других причин, виновному лицу назначают наказание, размер которого не отвечает общественной опасности содеянного и личности виновного, эффективность деятельности правоохранительных органов может быть значительно снижена и даже сведена на нет<sup>16</sup>.

## ВЫВОД

Следовательно, учитывая данные, полученные от проведенного исследования, можно сделать итог особенностей применения уголовно-правовых средств охраны экономики Украины. Главной особенностью, которая отличает данную категорию преступле-

<sup>15</sup> Там же – С. 52

<sup>16</sup> Антипов В.И. Тіньова економіка та економічна злочинність: світові тенденції, українські реалії та правові засоби контролю: (теоретико-методологічні узагальнення) – С. 847



ний от других групп есть назначение основного наказания в виде штрафа. В частности, стоит отметить и на значительные изменения внесены в 2011 году в связи с принятием Закона Украины “О внесении изменений к некоторым законодательным актам Украины относительно гуманизации ответственности за правонарушение в сфере хозяйственной деятельности”<sup>17</sup>, когда ряд наказаний были заменены именно на штраф. Однако эффективность внедрения вышеуказанных нововведений подтвердят или опровергнут результаты последующих исследований.

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CIP - Каталогизација у публикацији  
Народна библиотека Србије, Београд

343.85(082)

343.9(082)

**MEĐUNARODNI naučni skup “Dani Arčibalda Rajsa” (2014 ; Beograd)**

Thematic Conference Proceedings of International Significance. Vol. 1 / International Scientific Conference “Archibald Reiss Days”, Belgrade, 3-4 March 2014 ; [organized by] Academy of Criminalistic and Police Studies ; [editors Srđan Milašinović, Darko Simović, Biljana Simeunović-Patić] = Tematski zbornik radova međunarodnog značaja. Tom 1 / Međunarodni naučni skup “Dani Arčibalda Rajsa”, Beograd, 3-4. mart 2014. ; [organizator] Kriminalističko-policijska akademija ; [urednici Srđan Milašinović, Darko Simović, Biljana Simeunović-Patić]. - Belgrade : Academy of Criminalistic and Police Studies ; Bonn : German Foundation for International Legal Cooperation (IRZ) = Beograd : Kriminalističko-policijska akademija ; Bon : Nemačka fondacija za međunarodnu pravnu saradnju (IRZ), 2014 (Belgrade = Beograd : ArtGrbić Illustrated Studio). - 534 str. : ilustr. ; 24 cm

Tiraž 200. - Preface: str. 9. - Napomene i bibliografske reference uz tekst. - Bibliografija uz svaki rad.

ISBN 978-86-7020-278-8 (ACP)

ISBN 978-86-7020-190-3 (za izdavačku celinu)

1. Up. stv. nasl. 2. Kriminalističko-policijska akademija (Beograd)

a) Криминалитет - Сузбијање - Зборници

b) Криминалистика - Зборници

COBISS.SR-ID 206896908