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# THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN ENTERPRISES IN SERBIA

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Primena informaciono-komunikacionih tehnologija u  
preduzećima u Srbiji

## Abstract

In this paper, we analyse the usage of information and communication technologies (ICT) in enterprises in Serbia. The analysis is based on the data generated from the statistical survey of the Statistical Office of the Republic of Serbia for 2016 (ICT Usage – Enterprises) and on the Eurostat data on the usage of ICT in enterprises in the EU Member States (EU-28). We observed the following indicators of the usage of ICT: fixed broadband access, speed of Internet connections, employment of ICT specialists, Internet presence (enterprises having a website), use of social media, use of cloud computing services, enterprises engaged in e-commerce (percentage of enterprises and share of online sales in total turnover). Based on these indicators, the comparison with the EU Member States has been made. It has been found that the accomplished level of the usage of ICT in enterprises in the Republic of Serbia is above the European average, yet still below the level of the developed EU economies. When cloud computing services and the development of web-based sales are considered, Serbia still lags behind the EU Member States.

**Keywords:** *information and communication technologies, cloud computing, e-commerce, enterprises, Serbia*

## Sažetak

U radu je analizirana primena informaciono-komunikacionih tehnologija (IKT) u preduzećima u Srbiji. Analiza je zasnovana na podacima Republičkog zavoda za statistiku za 2016. godinu koji se dobijaju statističkim istraživanjem „Upotreba informaciono-komunikacionih tehnologija u privrednim društvima“ i na podacima Eurostat-a o primeni IKT u preduzećima u zemljama članicama Evropske unije (EU-28). Posmatrani su sledeći indikatori upotrebe IKT: širokopoljaska internet konekcija, brzina internet konekcije, zapošljavanje IKT stručnjaka, prisustvo na internetu (posedovanje veb sajta), korišćenje društvenih medija, korišćenje usluga cloud računarstva, pokazatelji elektronske trgovine (procenat preduzeća koja učestvuju u elektronskoj trgovini i učešće e-trgovine u ostvarenom prometu). Na osnovu ovih indikatora, izvršeno je poređenje sa zemljama Evropske unije. Ocenjeno je da je dostignut nivo u primeni IKT u preduzećima u Srbiji iznad evropskog proseka, mada još uvek ne na nivou razvijenih evropskih ekonomija, naročito kada je u pitanju korišćenje usluga cloud računarstva i razvoj elektronske trgovine, u kojima Srbija još uvek zaostaje za evropskim zemljama.

**Ključne reči:** *informaciono-komunikacione tehnologije, cloud računarstvo, e-trgovina, preduzeća, Srbija*

## Introduction

Every year since 2006, the Statistical Office of the Republic of Serbia has been conducting a survey on the usage of information and communication technologies (ICT) in enterprises in Serbia. In this survey, data are collected from companies across Serbia on the application of ICT in enterprises, on the use of computers, Internet usage, characteristics of the information system in enterprises and electronic business of the company. The title of the survey is ICT Usage – Enterprises and the research results have been published every year in Statistical Releases, The Statistical Yearbook of the Republic of Serbia, in the chapter named Information Technologies, and on the website of the Statistical Office. Also, in 2015 and 2016, the Statistical Office published two separate publications named Usage of Information and Communication Technologies in the Republic of Serbia in which research results have been presented in detail.

However, despite the fact that the results of the research are published regularly and that in the past ten years of conducting this research a solid information base has been established, the obtained data have not been analysed in detail by the scientific and professional public so far. The data have not been observed in a wider context yet, such as, for example, the achieved level of ICT application in enterprises, ICT development in enterprises over the years, the degree of acceptance of new information technologies, directions for future development, and the like.

Such analyses are largely done for developed market economies, in which statistics on information society has been developing for more than a decade. Statistics on information society is the field of official statistics that deals with the collection of data on the access and use of ICT in households/among individuals and in enterprises. In the European Union, the statistics on information society has been developing since 2004, and Eurostat collects and publishes data on the application of ICT in enterprises within the section Digital Economy and Society [6]. The statistics on information society is complex and includes the collection of data on the production, application and effects of ICT on economy and society. Based on the collected official data, the literature analyses the results of ICT applications in developed market economies, the effects of

ICT on the competitiveness and productivity of enterprises [2], [3] and effects on overall economic performance [12]. In Serbia, the preliminary assessment of the achieved level of development in the application of ICT would be the first step in the direction of such analyses. Two important aspects to be observed have been set: the analysis of the achieved level of development in the application of ICT in enterprises and comparison with the EU countries.

So far, the level of the development of ICT in Serbia has been addressed by the Information Society Development Strategy in the Republic of Serbia until year 2020, adopted by the Government of the Republic of Serbia in 2010. The strategy analyses the application and development of ICT in Serbia in terms of defining the basic goals, principles and priorities in the development of the information society. In scientific papers, the achieved level of ICT development in Serbia was analysed in [14] based on the composite index called the Networked Readiness Index (NRI) defined by the World Bank. In this index, the application of ICT in enterprises is taken into account through the indicators defined by the World Bank regarding the application of the Internet in business operations and the indicators of the possibilities of firm-level technology absorption. In [21], the impact of ICT on productivity and competitiveness of enterprises in Serbia was examined through the analysis of one segment of Serbian industry (print media industry). Similarly, using the case study method, the impact of ICT on the company's performance in telecommunications, education, manufacturing, financial and insurance activities and retail trade is analysed in [1], while another study [11] points to the importance of ICT for improving the business of companies and travel agencies in the field of accommodation and food service.

Therefore, it could be said that the number of scientific papers on the application of ICT in Serbian enterprises is disproportionately small in relation to the importance of the topic. In addition, the authors have not dealt with the official data and indicators of the Statistical Office of the Republic of Serbia for the entire economy. The aim of this paper is to fill this gap and to estimate the achieved level of application of information and communication technologies in companies in Serbia based on the available data of the Statistical Office of the Republic of Serbia.

For this purpose, the most important indicators of the usage of ICT, collected and published by the Statistical Office of the Republic of Serbia, will be analysed. These indicators are: fixed broadband access, employment of ICT specialists, speed of Internet connections, Internet presence and use of social media, use of cloud computing, enterprises engaged in e-commerce. The significance of these indicators stems from the importance Eurostat attributes to them in its analyses. Eurostat statistics on the information society collects data on a large number of indicators, but those mentioned here are the most important ones for the analysis of the usage of ICT in enterprises in the countries of the European Union [16].

After the introduction, in the second part of the paper, the basic terms of the methodology of the Statistical Office of the Republic of Serbia regarding data collection in the field of ICT applications in enterprises are presented. In the third part of the paper, we present the values of indicators in Serbia and a comparison with the values of those indicators in the European Union. Fourth part of the paper gives the expected directions in the application of ICT in enterprises in Serbia and points out the effects of ICT that can be expected in the future. In conclusion, the achieved level of ICT application in enterprises in Serbia is evaluated and the need for further research in this field is presented.

## Methodology and data sources

The statistical survey titled ICT Usage – Enterprises has been carried out by the Statistical Office of the Republic of Serbia regularly since 2006. The aim of the survey is to provide data on the usage of information and communication technologies by enterprises in the Republic of Serbia. The survey is conducted according to the Eurostat methodology. Initially, in the early years, the research involved 600 enterprises. Data have been collected on using computers in business (“Does your company use computers in business?”), information technology (wire-based LAN, intranet, wireless LAN, extranet), Internet access, the possession of a website and the use of electronic services of public administration. [16]. Over time, new questions have been added to the research, such

as questions about using Enterprise Resource Planning – ERP system, Customer Relationship Management (CRM) and types of services provided on the website [17]. Since 2015, the research has been further expanded and is now based on a comprehensive questionnaire in which questions are grouped according to the following modules [18]:

- Use of Computers;
- ICT Specialists and Skills;
- Access to and Use of the Internet;
- Use of Cloud Computing Services;
- Big Data Analytics;
- Electronic Invoicing;
- E-Commerce.

Based on the questionnaire, a large number of data is collected within the appropriate modules. For example, within the module “Access to and Use of the Internet”, a number of indicators is defined in relation to the use of fixed broadband connection to the Internet for business purposes, use of mobile connection to the Internet, use of a website and social media, public authorities’ Internet services and automatic exchange of information between different functions of the enterprise. The research is fully in line with the Eurostat methodology and the indicators obtained are comparable with the indicators for the countries of the European Union.

In accordance with the methodology of Eurostat, the survey covered companies with 10 or more employees, dealing with the following activities: manufacturing, construction, wholesale and retail trade, repair of motor vehicles, hotels, camps and other accommodation for short stays, transport, storage and communications, real estate activities, renting and business activities, cinematographic and video shooting activities, radio and TV activities, as well as the financial sector (banks and insurance companies). Companies in the survey are ranked by size to small (10-49 employees), medium (50-249) and large (more than 250 employees). In 2015, the survey covered 1,361, and in 2016 as many as 1,673 companies in the Republic of Serbia. Starting from 1999, the Statistical Office of the Republic of Serbia has not collected data for the AP Kosovo and Metohija, which is why it is not included in the data for the Republic of Serbia.

The results of the research are published in the publications of the Statistical Office and are also available

on the website of the Statistical Office in the electronic database. However, the Statistical Office's database is not fully updated and contains only a small number of indicators on the use of computers and the Internet in enterprises, by company size [7].

In addition to the data from the Statistical Office of the Republic of Serbia, Eurostat data from the field of digital economy and society were also used in this paper. These data are available in the Eurostat publications and on the Eurostat website, as well as in the Eurostat database [5]. For most indicators, data in the Eurostat database are available starting from 2009 onwards.

### ICT application in Serbian companies – main findings and comparison with the EU

In 2016, 99.8% of enterprises used a computer in their operations in the Republic of Serbia. The same percentage of enterprises, 99.8%, has an Internet connection, so practically all companies in Serbia use the Internet. Also, 99% of enterprises in Serbia have broadband Internet connection. As explained in [19], broadband Internet connection not only allows faster access to the Internet, but also changes the overall way of using the Internet, since it enables the download of information from the Internet much faster than the traditional dial-up modem connection, which is why this is one of the basic indicators of the development of ICT use in the European Union since 2005.

In 2016, 92% of enterprises in the EU-28 countries used fixed broadband connection to access the Internet, while in Serbia this percentage has been above 95% since

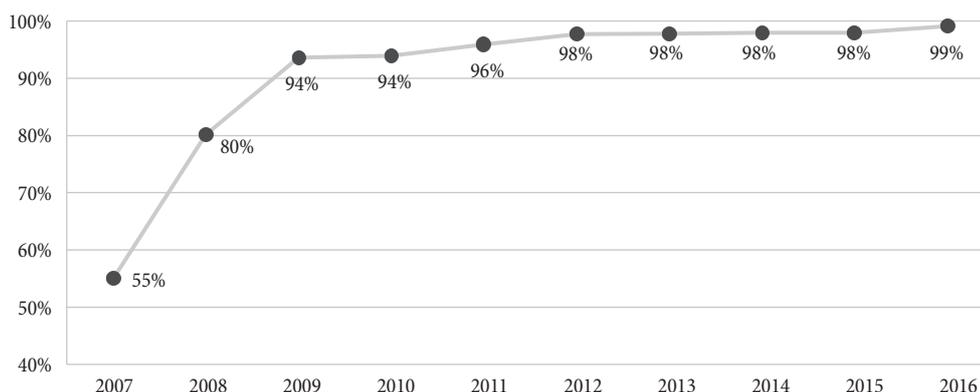
2011 (see Figure 1). Therefore, companies in Serbia are able to use all the advantages of the fast Internet, including faster accessibility to information, downloading of various Internet content, possibility of communication among employees, possibility of communication with external persons, e-business and more.

In 2016, ICT experts in Serbia have been employed in 22% of enterprises, while the average for the EU-28 is one fifth or 20% of enterprises. As much as 30% of companies in Serbia have declared that they had vacancies for ICT specialists that were difficult to fill. Companies in EU countries, however, do not have such problems, so, in 2016, only 5% of companies reported that they had difficulties in filling vacancies for ICT professionals.

The next significant indicator is the speed of Internet connection. In 2016, approximately 28 % of enterprises in the EU-28 had Internet connection speed that was within the range of  $\geq 2$  Mb/s but  $< 10$  Mb/s, with a similar but slightly smaller share (26 %) having a connection that was in the range of  $\geq 10$  Mb/s but  $< 30$  Mb/s. Approximately one fifth (19 %) had a connection in the range of  $\geq 30$  Mb/s but  $< 100$  Mb/s. In Serbia, the share of enterprises that had Internet connection speed within the range of  $\geq 2$  Mb/s but  $< 10$  Mb/s was 35%, 42% of them were in the range of  $\geq 10$  Mb/s but  $< 30$  Mb/s, while the speed of 17% of enterprises was in the range of  $\geq 30$  Mb/s but  $< 100$  Mb/s.

The percentage of enterprises with the Internet connection speed of less than 2 Mb/s is low in both Serbia and the EU, while the percentage of companies with Internet connection speed greater than 100Mb/s is significantly higher in the EU than in Serbia (13% compared to 5%).

Figure 1: Broadband Internet connection in enterprises in Serbia 2007-2016 (% of enterprises)



Source: Statistical Office of the Republic of Serbia

Figure 2 (see below) facilitates the comparison. It can be concluded that in terms of Internet connection speed, companies in Serbia have still not reached the level of the European Union. The reason for this is the fact that the speed of Internet connection depends primarily on the availability of transmission technology or the available infrastructure, which in Serbia is still not at a satisfactory level. However, given the differences that exist in terms of the level of infrastructure development in Serbia and the countries of the European Union, it can be said that this gap is not too large.

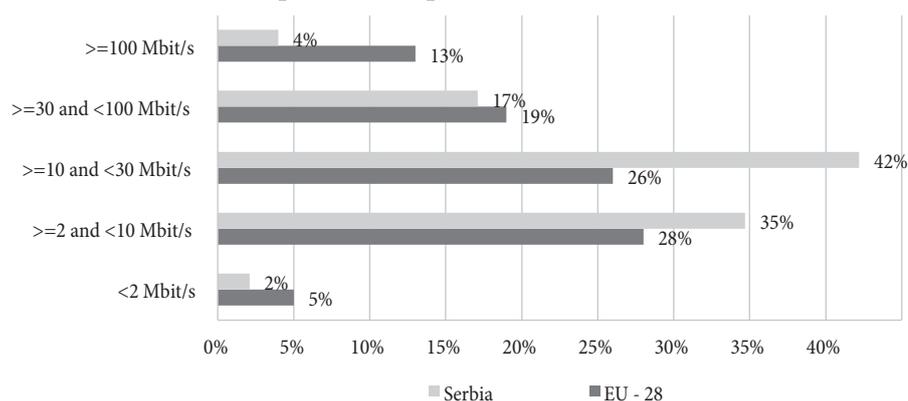
In 2016, more than three fourths of the EU-28 companies, or 77%, had their own website. In Serbia, 81% of companies have their own website. In this respect, Serbia left the newer EU member states behind, such as Croatia (69%), Romania (42%), Bulgaria (51%) and even France (68%), Hungary (68%), Greece (66%), and it is approaching the Scandinavian countries such as Sweden (90%), Finland (95%) and developed European countries like Germany (89%). A high percentage of companies that own a website say that companies in Serbia pay great attention to their visibility on the Internet, in which they find their business opportunity and the opportunity to advertise on the domestic and foreign markets. The website is owned by almost all large companies – 94%, while the percentage of medium-sized and small companies that have a website is somewhat smaller, accounting for 90% of medium-sized and 78% of small businesses.

Most often, enterprises in Serbia use their websites to display the description of goods or services and the price lists (87%), personalised content in the website for

regular visitors (84%), possibility for visitors to customise or design online goods or services (70%), links to the enterprise's social media profiles (42%) and online ordering or reservation (23%). In terms of online reservation or ordering of products, the main activities are accommodation and food services where 69% of companies use the website for ordering or reservation (for example, travel agencies). The following are wholesale and retail trade (37% of enterprises) and information and communication (32% of enterprises). There is another, new type of service offered on the website, adjusted to customers, which is chat with users, allowing real-time communication, but it is not yet covered by the survey.

As regards the use of social media, 45% of EU companies use some of the social media, while in Serbia this percentage is 36%. Differences in the use of social media between the EU countries are large and range from countries where more than 50% of companies use social media (the Netherlands, Belgium, Scandinavian countries), to those in which this participation is below 30% (the Czech Republic, Slovakia, Romania, Poland, Lithuania). In Serbia, as in most EU countries, the most popular form of social media are social networks. In Serbia, 36% of companies use social networks in their business (Facebook, LinkedIn, XING, Yammer), 15% use multimedia-content-sharing sites, such as YouTube, Flickr, Picasso, and 13% use blog/Twitter. The share of enterprises using Wiki-based knowledge-sharing tools is 8%. Regarding comparison with the EU-28, see Figure 3 below. In terms of the use of social networks, the main activities are accommodation and food services (67% of enterprises), information and

**Figure 2: Internet connection speed in enterprises in Serbia and EU-28, 2016 (% of enterprises)**



Source: Statistical Office of the Republic of Serbia, Eurostat

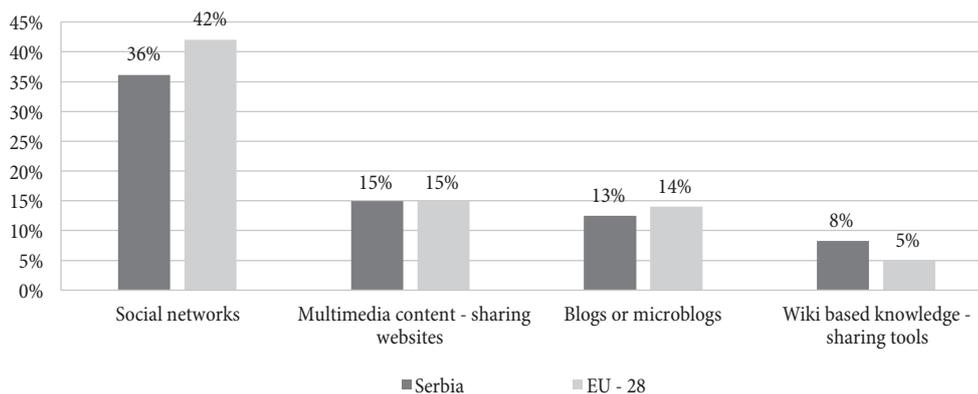
communication (66%), wholesale and retail trade (43%), administrative and support service activities (50%) and real estate activities (37%). Although official data on the use of social networks are not available yet, it is widely known that social networks are mostly used for free product advertising, communication with potential customers, and often for ordering products (Facebook), as well as for various notifications (Twitter). The particular advantage of social networks is the possibility of communication, to which both companies and customers attach great importance. The truth is this communication does not take place in real time, but it is easy for buyers and cheap for businesses, because there are no costs of creating and maintaining a website and renting a domain.

The use of cloud computing is another important indicator of the application of ICT in enterprises. This indicator has lately been given a lot of attention in analyses because cloud computing has become synonymous with new information technologies. Cloud computing is a combination of hardware, software, expertise and online services, which, among other things, includes computers that are networked under the same network operating system, have the flexibility to change resources and can allocate these resources to both simple and complex applications [15]. Cloud computing services for enterprises include various ICT services that are accessed via the Internet: e-mail, storage of files, hosting for the enterprise database, use of office software, use of financial or accounting software applications, use of CRM software, computer power to run the enterprise’s own software. In the EU-28, in 2016, cloud computing services were used by 21% of

enterprises, mostly large enterprises (45%), medium-sized enterprises (29%) and small enterprises (19%). In Serbia, this percentage is much lower. Only 9% of companies use cloud computing services: 13% of large enterprises, 9% of medium-sized and 9% of small businesses. Regarding the use of cloud computing services in the EU, Nordic countries are in the lead (over 40% of enterprises), while in Greece, Lithuania, Poland, Bulgaria and Romania, this percentage is below 10%. Figure 4 below shows the types of cloud computing services that were used in Serbia and the European Union in 2016. Based on these data, it can be seen that companies in Serbia are more reliant on cloud platform in order to upgrade their own capacities, whether it is hosting a database or using software, while the two most common uses of cloud computing services in the EU-28 were e-mail hosting and storing files in electronic form.

The term “electronic commerce” (electronic commerce or e-commerce) refers to the purchase and sale of goods and services over the Internet. It is a set of commercial activities that are conducted through electronic networks (most often over the Internet) and whose ultimate goal is selling or purchasing products or services [15, p. 139]. This term should be distinguished from the term e-business, which is of a newer date and means generally doing business over the Internet. In accordance with the Eurostat methodology, the term e-sales concerns the receipt of orders by methods specifically designed for the purpose of receiving orders, either via electronic data interchange (EDI) or through websites or apps (orders received by way of hand-typed e-mail messages are not included).

**Figure 3: Enterprises using social media, by type of social media, Serbia and EU-28, 2016 (% of enterprises)**



Source: Statistical Office of the Republic of Serbia, Eurostat

The data show that the share of enterprises in the EU-28 performing e-sales was 20% in 2015, while in Serbia this percentage was 23% (this is the latest available data, data for 2016 have not yet been published). However, the share of enterprises is not the only important indicator. Even more important is the participation of such turnover in the total turnover of enterprises. For Serbia, this percentage is still low and in 2014 it amounted to only 6% (source: Eurostat database, also the latest data available), while the average at the EU-28 level in 2014 was 15% of the total turnover.

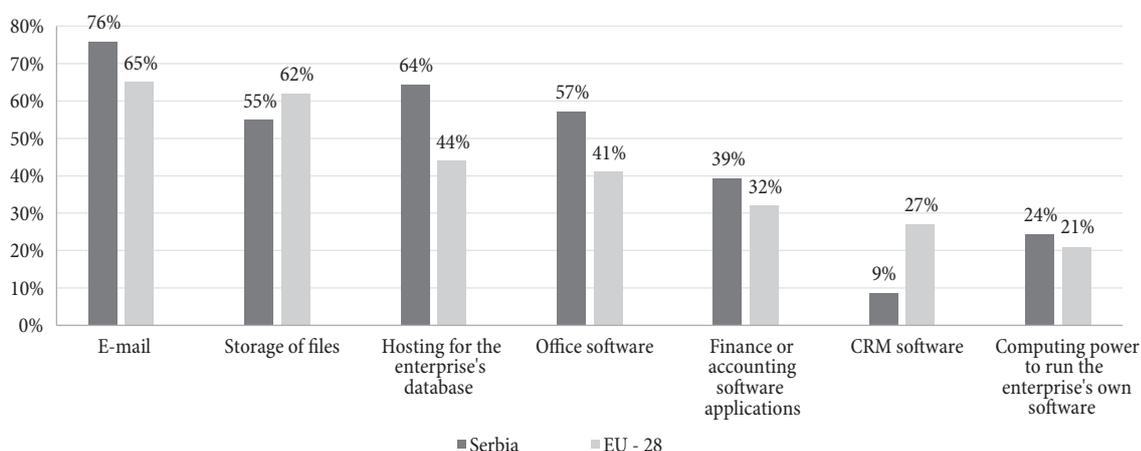
Companies in Serbia generally receive orders for their products through a website or mobile applications, while the share of companies receiving orders via EDI is low and amounts to only 1%. Companies themselves order goods over the Internet more than they sell their own products, so 41% of companies in Serbia order products and services for the needs of their own production or simply for the consumption in the company.

Finally, Table 1 summarises the observed indicators for Serbia and the EU-28.

## Directions for future development and expected effects

When analysing the data in Table 1, it can be seen that companies in Serbia are lagging behind the European Union mostly in the use of cloud computing and e-commerce development. The greatest advantage of cloud computing is of financial nature. Based on Eurostat data presented and commented in [10, p. 108], the use of cloud computing services in the EU countries has reduced the costs of building ICT infrastructure from 23% (Croatia), up to as much as 82% (Slovakia). In addition to financial aspects, cloud computing has many other advantages: the use of cloud computing is the use of technology that, and when necessary, does not have to be installed on computers. Also, a person is paying exactly the technology they are using [13, p. 2]. This is an important issue when choosing a model for building ICT infrastructure. “Pay what you use” is a model that represents cloud computing and it is certainly cheaper for the company than the model “Pay

**Figure 4: Enterprises using cloud computing services, by purpose, Serbia and EU-28, 2016 (% of enterprises)**



Source: Statistical Office of the Republic of Serbia, Eurostat

**Table 1: ICT usage indicators in enterprises in Serbia and EU-28, 2016 (% of enterprises)**

ICT usage indicator	Serbia	EU - 28
Broadband internet connection	99%	92%
Enterprises employed ICT specialists	22%	20%
Enterprises having a website	81%	77%
Enterprises using social networks	36%	42%
Enterprises using cloud computing services	9%	21%
Enterprises making e-sales <sup>1</sup>	23%	20%
Share of web sales in total turnover <sup>2</sup>	6%	15%

<sup>1</sup> Data for 2015 – the latest available data

<sup>2</sup> Data for 2014 – the latest available data

Source: Statistical Office of the Republic of Serbia, Eurostat

for everything in advance”, because, in terms of costs, payment in advance is the primary financial problem with internally based ICT infrastructures.

The most famous companies offering cloud computing services are IBM, Google, Microsoft and Amazon. Cloud services in Serbia are offered by Telekom, followed by EUnet, as well as Coming - Computer Engineering and Net ++. These companies offer different types of cloud services and many customised packages for users/companies. However, the limiting factor for using these services is their price. Cloud services are not cheap, but they are nevertheless particularly attractive to small and medium-sized enterprises that cannot afford big initial investments in IT equipment. These companies are the most interesting target group for cloud service providers. Telekom is pleading that, as far as the sale of cloud services is concerned, “traditionally business users, primarily small and medium enterprises, are targeted. For such enterprises, it is important that they do not have large initial investments, that they can have support 24/7 and that they can economically use the computer infrastructure they would not be able to provide themselves if they carried out the project independently. Then, there are public companies and government agencies that can provide services in a safe and economical way through cloud infrastructure. According to some studies, while raising the level of automation of business processes, and therefore the competitiveness and profitability of companies, the introduction of cloud services into public companies, health, education and public administration would bring Serbia substantial investment and operational costs that can be measured in hundreds of millions of euros a year” [9].

Regarding the development of e-commerce in Serbia, the share of companies receiving orders over the Internet in Serbia is 23%, which is above the percentage in, for example, Lithuania, Bulgaria and Romania, where it does not exceed 10% and almost at the level of developed European countries: Belgium, Sweden, Denmark or Germany, where it ranges between 25% and 30%. In terms of the achieved turnover via e-commerce, Serbia, however, lags substantially behind the EU, although it is possible that by 2017 the turnover will increase compared to the one shown in Table 1, where the data for 2014 are given. As the most important problems in the development of e-commerce,

companies in Serbia indicated “problems related to logistics (delivery of goods or delivery of services)”, which accounted for 42% of enterprises and “the costs of introducing web sales”, which accounted for 36% of enterprises, while other obstacles, such as the legislative framework or security issues, are of minor importance [19]. Even “problems related to payment” are not as important for businesses as might have been expected for Serbia, since only 2.7% of enterprises report this problem.

In addition to logistics infrastructure, which is, as is commonly known, underdeveloped in Serbia, the companies have not unjustifiedly indicated the “costs of introducing web-based sales” as a significant limiting factor for the development of electronic commerce. The most important precondition for the development of electronic commerce is for an enterprise to have an interactive website that offers the entire sales structure with visible prices, products, consumer basket and ordering systems. Having a website, however, is not cheap for Serbian companies. According to the authors’ research, in the Republic of Serbia, the creation of the most basic website (static, 5 pages maximum) costs 50 euros, the creation of an average website with a gallery, a contact form (up to 10 pages) costs 150 euros, while the creation of the most complex website with the development of web software and the possibility of manipulating the contents of the site costs € 600 or more. The cost of maintaining a website depends on several factors, above all on the complexity of the website, and is additionally charged. There is a special charge for domain registration and/or a hosting package. Web hosting represents providing space on the hard disk of a server that is deliberately configured to display different Internet content provided by the hosting provider. Through an administrative approach, with a hosting package, it is possible to add domains and subdomains, create your own e-mail addresses, create databases, etc. The price of the domain and hosting package is about 4,000 dinars per year, depending on the provider [8].

It is therefore clear what “bothers” companies in Serbia when it comes to the introduction and development of electronic commerce. Thus, those problems could serve as recommendations for incentives and new goals of some next ICT Development Strategy for Serbia. Once these barriers are overcome, one can expect the well-

known effects of introducing e-commerce: lower costs for businesses and drop of consumer prices have already been recorded in countries with longer experience in e-commerce development (USA, UK, European countries) [12, p. 251]. The development of e-commerce can also produce other desirable effects in Serbia, such as export growth and entry into the European market.

## Conclusion

Looking at the selected indicators and comparing the data from the European Union, one can conclude that companies in Serbia understood the importance of modern information and communication technologies for their business on time. In 2016, more than 99% of businesses used computers and the Internet in their operations. Enterprises are adopting new information technologies, employing ICT professionals, using cloud computing services and introducing electronic commerce. As regards the observed indicators, in terms of the use of the Internet, the employment of ICT specialists and the possession of a website, Serbia is above the EU-28 average. In terms of e-commerce, Serbia lags behind the EU average, and the same applies to the use of cloud computing services. There is still plenty of room for using social media and improving communication with consumers through social networks in relation to the average of the European Union and most European countries. However, given the importance recently attached to social networks, it can be expected that Serbia will soon reach this average and even exceed it.

However, when making a comparison, one should be cautious because the values of the indicators vary from country to country, depending on the differences, on a national level, in the size and structure of enterprises, industrial specialisations, level of development of ICT infrastructure, and even the level of development and the style of consumer culture to which businesses are adapting. The average values of indicators that are lower for the EU than for Serbia are the consequence of lower values for countries such as Romania, Bulgaria, Lithuania, Estonia, Poland, where ICT infrastructure is still not at the level of the one in Germany, Austria, France, the Netherlands, Belgium or the Scandinavian countries. Therefore, the achieved level of ICT usage in enterprises in

Serbia could be assessed as: above the European average, but not at the level of the developed European economies. Serbia trying to compare itself with the developed European economies, despite the differences in IT infrastructure and the achieved level of development, should not be considered too ambitious. There is no reason for Serbia not to be at the level of these countries, because there are also small European economies (Iceland, Malta, etc.) that achieved remarkable results thanks to significant investments in this field.

When the data from [19] are analysed in detail, significant differences in the application of ICT can be seen, depending on the size of the company. It can be concluded that the size of the company and the prices of ICT limit the use of ICT in companies in Serbia. In this regard, efforts should be made to increase the accessibility of ICT to small and medium-sized enterprises. It was precisely for these companies that the Information Society Development Strategy from 2010 envisioned "... a strong encouragement of the introduction of ICT into the business of small and medium-sized enterprises, which would contribute to increasing the competitiveness of the national economy" [20]. The analysis, however, shows that this goal has not been fully realised and that in 2016 big companies are still dominant in relation to the small and medium-sized ones in terms of almost all indicators, whereby the differences between companies can sometimes be unreasonably big.

The preliminary analysis based on the selected indicators, carried out in this paper, could be an introduction to a more detailed analysis, which should certainly be performed in Serbia. The next step would be the analysis of the impact that the application of ICT had on the development of Serbian economy. Has the development of ICT in companies really contributed to increasing the competitiveness and productivity of Serbian companies? An additional analysis would comprise the comparison of other numerous indicators of ICT application, as well as a comprehensive analysis of the size of enterprises, activities of Serbian economy and regions. A whole series of topics would open up in such a research – questions concerning the future ICT policy development, the problem of regional differences. A more detailed analysis would indicate the measures of economic and structural policy and the goals to be defined when formulating the next ICT development strategy after 2020.

## References

1. Bradić-Martinović A., & Zdravković A. (2012). Information and communication technologies in basis for the improvement of companies' performance in Serbia. In J. S. Andrade, M. C. N. Simões, I. Stošić, D. Erić, H. Hanić (Eds.), *Managing Structural Changes – Trends and Requirements* (573-588). Portugal: Faculty of Economics of the University of Coimbra. Retrieved from <http://www.iem.bg.ac.rs/images/stories/download/managerstr.pdf>
2. Eurostat (2008). *Information society: ICT impact assessment by linking data from different sources*. Retrieved from <http://ec.europa.eu/eurostat/web/digital-economy-and-society/methodology>
3. Eurostat (2012). *ESSnet on linking of microdata on ICT usage*. Retrieved from <http://ec.europa.eu/eurostat/web/digital-economy-and-society/methodology>
4. [http://ec.europa.eu/eurostat/statistics-explained/index.php/Digital\\_economy\\_and\\_society\\_statistics\\_-\\_enterprises](http://ec.europa.eu/eurostat/statistics-explained/index.php/Digital_economy_and_society_statistics_-_enterprises)
5. <http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database>
6. <http://ec.europa.eu/eurostat/web/digital-economy-and-society/overview>
7. <http://webzrzs.stat.gov.rs/WebSite/Public/ReportView.aspx>
8. <http://www.webdizajne.rs/registracija-domena-zakup-hostinga>
9. [https://www.benchmark.rs/artikal/telekom\\_srbija\\_cloud\\_computing\\_usluge-2210/2](https://www.benchmark.rs/artikal/telekom_srbija_cloud_computing_usluge-2210/2)
10. Krčál, M., & Tomíšek J. (2016). When cloud does not fit: Experience from a single case justification study. In P. Silva, R. Quaresma & A. Guerreiro, 10th European Conference on Information Systems Management: ECISM 2016. The University of Evora, Portugal.
11. Miličević S., Podovac M., & Sekulić D. (2013). Uloga i značaj informacionih tehnologija za razvoj turizma Srbije, 13th International Conference "Research and Development in Mechanical Industry, RaDMI 2013". In Dašić J. (Chair), Conference conducted by SaTCIP (Scientific and Technical Center for Intellectual Property) Ltd., Kopaonik, Serbia.
12. OECD (2004). *The economic impact of ICT measurement, evidence and implications*. Retrieved from [http://www.oecd-ilibrary.org/economics/the-economic-impact-of-ict\\_9789264026780-en](http://www.oecd-ilibrary.org/economics/the-economic-impact-of-ict_9789264026780-en)
13. Reese G. (2009). *Cloud application architectures: Building applications and infrastructure in the cloud*. Sebastopol, California: O'Reilly Media.
14. Soldić-Aleksić J., & Stankić R. (2015). A comparative analysis of Serbia and the EU member states in the context of networked readiness index values. *Economic Annals*, 60(206), 45-86.
15. Stankić R. (2017). *Poslovna informatika*. Beograd: Centar za izdavačku delatnost Ekonomskog fakulteta u Beogradu.
16. Statistical Office of the Republic of Serbia (2006). *Use of information – communications technologies in the Republic of Serbia, 2006*. Retrieved from <http://webzrzs.stat.gov.rs/WebSite/repository/documents/00/00/10/65/PressICT2006e.pdf>
17. Statistical Office of the Republic of Serbia (2011). *Usage of information and communication technologies in the Republic of Serbia, 2011*. Retrieved from <http://webzrzs.stat.gov.rs/WebSite/Public/PageView.aspx?pKey=206>
18. Statistical Office of the Republic of Serbia (2015). *Usage of information and communication technologies in the Republic of Serbia, 2015*. Retrieved from <http://webzrzs.stat.gov.rs/WebSite/repository/documents/00/01/85/80/PRESS ICT 2015e.pdf>
19. Statistical Office of the Republic of Serbia (2016). *Usage of information and communication technologies in the Republic of Serbia, 2016*. Retrieved from <http://webzrzs.stat.gov.rs/WebSite/repository/documents/00/02/25/91/ICT2016e.pdf>
20. *Strategija razvoja informacionog društva u Republici Srbiji do 2020. godine*, Službeni glasnik Republike Srbije 51/2010.
21. Vidas-Bubanja M., & Bubanja I. (2015). ICT as prerequisite for economic growth and competitiveness – Case study print media industry. *Journal of Engineering Management and Competitiveness (JEMC)*, 5(1), 21-28.



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