Economic Horizons, September - December 2019, Volume 21, Number 3, 273 - 285
UDC: 33 eISSN 2217-9232

www. ekfak.kg.ac.rs

Review paper
UDC: 004:658:061.1EU
doi:10.5937/ekonhor1903281Z

THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES BY ENTERPRISES IN THE EUROPEAN UNION MEMBER COUNTRIES

Aleksandra Zecevic*[1], Jelena Radovic Stojanovic[2] and Aleksandar Cudan[2]

[1]*Faculty of Economics, University of Belgrade, Belgrade, The Republic of Serbia*
[2]*The Academy of Criminalistic and Police Studies, Department of Criminalistics, Belgrade*

The paper analyzes the use of information and communication technologies (ICT) in enterprises in the European Union member states. The objectives of the analysis were to examine the level reached in the application of ICT in European enterprises and explore the differences in ICT usage that exist between the EU member states. The analysis is based on the Eurostat data on ICT usage in enterprises in the European Union countries (EU-28) for the years 2018 and 2017. The following indicators of ICT usage were analyzed: fixed broadband access, the speed of the internet connections, the presence of the Internet (enterprises having a website), the use of social media, the use of cloud computing services, e-commerce indicators (the share of the enterprises making e-sales and the share of e-commerce in the total turnover) and the indicators of e-business integration - the share of the enterprises using enterprise resource planning (ERP), customer relationship management (CRM) and the supply chain management (SCM) software applications. A comparative analysis of the EU countries by the value of these indicators was carried out. The main focus in the analysis was to identify the factors that influence the difference in the value of the ICT indicators between the countries. The analysis has shown that the regional position, the geographic characteristics, the size of the country and the level of its economic development are the factors that influence these differences.

Keywords: information and communication technology, e-commerce, e-business integration indicators, enterprises, European Union

JEL Classification: O330, L86

INTRODUCTION

Despite the great attention being paid to the implementation and development of information and communication technology (ICT) in the EU countries and the importance given to it in the public, the media and science, there are still IT-related topics, even entire fields, which are insufficiently dealt with. This is especially true when it comes to its usage in enterprises. This paper deals with one of these, not yet sufficiently researched topic, and analyzes the level

* *Correspondence to*: A. Zecevic, Faculty of Economics, University of Belgrade, Kamenicka 6, 11000 Belgrade, The Republic of Serbia; e-mail: azecevic@ekof.bg.ac.rs

achieved in the use of information and communication technologies in enterprises in European countries. Although there is a general opinion that, due to their economic development, the EU countries have come a long way in implementing ICT, there are still significant differences between them in this respect. The aim of the study was to analyze the achieved level in the use of ICT in enterprises in the EU countries, explore the differences and identify the factors that influence the use of ICT in enterprises. Of course, Europe, i.e. European institutions, primarily the European Commission and Eurostat, deal with these issues; in their analyses, however, they mainly focus on the member states individually. The subject matter of this paper is the identification of regularities, synthesizing the findings regarding the factors that influence the use of ICT in enterprises in general, rather than an analysis of only one individual country or a single group of countries within the European Union.

As the EU member states significantly differ in their characteristics (in terms of their population, surface area, geographic position, historical and cultural heritage, the structure of their economies, the achieved level of social and economic development, the level of technical and technological development, and so on), the research study rests on the hypothesis that the differences between the member states, which reflect on all the aspects of their economic and social life, have an impact on the adoption and application of information and communication technologies. The question that arises is: What are the differences, i.e. what are the characteristics of the countries that influence the use of ICT, in particular the use of ICT in enterprises? In order to answer this question, the statistical indicators of the use of information and communication technologies in enterprises collected and published by EUROSTAT are observed, and a comparative analysis among the countries based on the value of these indicators was carried out.

At the beginning of this paper, a review of the literature dealing with the usage of ICT in enterprises in the European Union is provided. Then, Eurostat's methodology used to collect the data and calculate the indicators of ICT usage in enterprises is presented in brief. The central part of the paper is dedicated to the description of the analysis of the selected indicators and the comparative analysis between the countries in order to point out the factors that influence the differences in the value of the indicators between the countries. In the conclusion, the main results of the analysis are summarized. Finally, the appendix provides the tables showing the ranking of the EU member states by the indicator values.

LITERATURE REVIEW

That the studies dealing with the economic aspects of the ICT implementation focus on a relatively small number of topics was observed as early as in 2015 (Roztocki & Weistroffer, 2015). To date, not much has changed; so, studies mostly deal with the following topics: the impact of ICT on the way enterprises do business and their efficiency and competitiveness growth (Real, Leal & Roldán, 2006), the impact of ICT on economic growth and development (Stankic, Jovanovic Gavrilovic & Soldic Aleksic, 2018), the economy and society as a whole (Roztocki, Soja & Weistroffer, 2019). If, as in (Bouwman, van der Hooff, van der Wijngaert & van Dijk, 2005), adoption, implementation, application and effects are analyzed when ICT usage in organizations is concerned, studies could be said to be dealing mainly with the effects of ICT on enterprises' operations, while ICT implementation and application in enterprises are insufficiently addressed, as is evidenced by a small number of papers. The adoption of advanced IC technology, such as cloud computing and big data analytics, has been in the focus of researchers' attention lately (for the most important characteristics and concepts of big data, see Chroneos-Krasavac, Soldic-Aleksic & Petkovic, 2016).

Regarding the studies dealing with ICT usage in the EU countries, the most important source of data is the European Commission. Each year, the European Commission releases the European Digital Progress Report (EDPR) for all the EU countries, which includes a digital profile of each country (Country Profile). In

that document, the progress of the EU member states in digitalization is evaluated. The evaluation uses the value of the Digital Economy and Society Index (DESI) for the country, combined with a qualitative analysis (European Commission, 2017). The Digital Economy and Society Index (DESI) is a composite index published by the European Commission, which quantifies progress in digitization (European Commission, 2019). Qualitative analysis includes an analysis of country-specific conditions and policies. The evaluation of the ICT implementation level for each country avoids value judgments (e.g. developed/ underdeveloped), dividing countries into medium-, high- and low-performing countries. For example, the countries that are DESI-rated at the average level are medium-performing countries; those being above the average are referred to as high-performing, whereas those below the average are low-performing countries. One major part of the Digital Progress Report, entitled the Digitalization of Enterprises, refers to the use of ICT in enterprises.

The Digital Progress Report is very detailed and contains a lot of data. The European Commission also publishes a large number of analyses and studies dealing with ICT application in European economies. On the other hand, there is not enough scientific work done in this field. Considering the expertise of the European Commission's reports and the abundance of published data, one might think that it is sufficient for the European Commission alone to deal with data, statistics and analyses. Apart from that expert perspective, however, there is a lack of the research initiative that is not solely related to European institutions. There is still plenty of room for research and every new aspect of the analysis and a different point of view could be helpful and give new insights.

Several studies dealing with ICT usage in enterprises in European countries have made efforts to rank the countries according to the level of the implementation achieved and identify the factors influencing the process of ICT adoption. J. Becker, A. Becker, P. Sulikowski and T. Zdziebko, (2018) rank the countries of Central Europe, the members of the European Union (Austria, the Czech Republic, Germany, Hungary, Slovakia, and Slovenia) according to ICT usage in enterprises using the analytic network process (ANP). The survey shows that, among these countries, Slovenia and Austria are the 2017 leaders in ICT usage in enterprises. A. Zečević and J. Radović-Stojanović (2018), analyze the use of ICT in enterprises in Slovenia, Croatia, The Republic of Serbia, Bosnia and Herzegovina, Macedonia, and Montenegro. Investment in and the development of the information and communication infrastructure are identified as the factors influencing ICT usage in enterprises in these countries. The study concludes that the EU member states, namely Slovenia and Croatia, are leading in ICT usage in their enterprises, especially so in the adoption of advanced technology, i.e. cloud computing and e-commerce. The use of information and communication technologies in Serbian enterprises in comparison with the European average is presented in (Stankić & Stojković, 2017).

The United Nations (UN), which ranks countries on the basis of the ICT Development Index (IDI), a composite index based on the 11 ICT indicators, also addresses the level of ICT implementation and country ranking. Based on the 2017 IDI Index, the best-ranked members of the European Union are Denmark, the United Kingdom, and the Netherlands (United Nations, 2018). J. Soldić-Aleksić and R. Stankić (2015), point to the Networked Readiness Index (NRI), a composite index calculated and published by the World Economic Forum. According to the Global Information Technology Report published by the organization, six European countries (Finland, Sweden, Norway, the Netherlands, Switzerland, and the United Kingdom) are among the 10 best-ranked countries by the NRI index value (World Economic Forum, 2016). The NRI structure is complex, as it consists of the 54 indicators of ICT application in the economy and society. Regarding the classification of the European countries by the success of ICT implementation on the basis of this index, it is regional, with the South, Central, and Eastern European countries seen to be lagging behind the countries of Northern and Central Europe.

DATA SOURCES AND METHODOLOGY

Eurostat's data on ICT usage in enterprises are a result of the statistical survey called "Usage of information-communication technology (ICT) in enterprises". The survey has been conducted once a year since 2002 in all EU Member States. It collects data on the use of ICT in enterprises, the use of the Internet, e-business, and the other relevant aspects of ICT usage in enterprises. The results are published within the Digital Economy and Society statistical area on the Eurostat website. The results are published in Eurostat's publications, as well as in Eurostat's database.

The methodological basis of the survey is the Methodological Manual for Information Society Statistics (Eurostat, 2018). The Methodological Manual defines the observation units, the research objective, the research time period, the target population, the variables to be covered, the indicators to be calculated, the aggregates to be obtained, the sampling system, the concepts, the nomenclatures, and all the other elements of the statistical survey. The common survey methodology has contributed to the comparability of the data obtained from all the EU countries. The survey based on this methodology is also being conducted in the other European states that are not the EU members.

The observation units, i.e. reporting units, in the survey are enterprises with 10 or more employees - small (10-49), medium (50-249), and large enterprises (enterprises with more than 250 employees). The survey is conducted on the basis of a questionnaire containing the questions grouped by several modules, these modules being: Computer Application, ICT Experts and Skills, Internet Access and Usage, Use of Cloud Computing Services, E-Commerce, Electronic Invoicing, Big Data Analytics. In the latest version of the methodology, the survey has been expanded with the following modules: Using a 3-D Printer and Using Robotics. The questionnaire is filled out in enterprises by phone or sent by e-mail. The data collected through the survey are submitted to the national statistical offices to process them, store them in a database, and publish them in official publications.

In this paper, fixed broadband access in enterprises, the speed of internet connections, the presence of the Internet (enterprises having a web site), the use of social media, the use of cloud computing services, e-commerce indicators (the share of the enterprises that make e-sales and the share of e-commerce in the total turnover) and the indicators of e-business integration (the share of the enterprises that use Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) and the Supply Chain Management (SCM) software applications are analyzed. EUROSTAT collects numerous data and calculates a number of the other indicators of the usage of information and communication technologies in enterprises, and the indicators observed in this paper are chosen because they are the indicators that EUROSTAT itself singles out as representative and most commonly used in its analyses. Relying on the EUROSTAT indicators, a comparative analysis of the values of the selected indicators by country, on the one hand, and the characteristics of the countries, on the other, is carried out in order to identify the regularities, group the countries with the indicator values at approximately the same level and identify the factors that influence the usage of ICT in enterprises.

ICT USAGE INDICATORS IN THE EUROPEAN UNION ENTERPRISES - EMPIRICAL DATA AND ANALYSIS

In this paper, the data on the usage of ICT in enterprises in the European Union member states were used. The data were downloaded from the Eurostat Database. The analysis relies on the 2018 data, and where the 2018 data have not been published yet, the latest available data, i.e. the 2017 data, were used.

In 2018, 92% of the enterprises in European Union used fixed broadband Internet access. A share of 90% was reached in 2012, and has not changed much since then, ranging from 92% to 93% from year to year (Figure 1). The share of the enterprises using a fixed broadband Internet connection is the indicator of the development of the information infrastructure,

and ranges from 81% of the enterprises in Latvia to 100% in Denmark. Belgium (96%), the Netherlands (99%) and Luxembourg (97%) have a high share of enterprises, whereas the major European economies, i.e. Germany (93%), France (94%), Italy (91%), and Spain (91%) recorded an average share. The countries with the share of enterprises using a fixed broadband connection below 90% are Romania (82%), Hungary (83%), Bulgaria (84%), Poland (87%), Slovakia (89%), the Czech Republic (89%), and Greece (84%). With the exception of Greece, these are Central and Eastern European countries. Greece is a coastal country, with a long, rugged coastline and a large number of islands and peninsulas, which dictates certain specific features regarding the development of the IT infrastructure. As the paper will show, there are also the other indicators that are common to individual coastal and island countries.

The basic form of the Internet presence pertains to enterprises having a website. Enterprises use their website to describe their goods or services, show prices, introduce customers to products, include links to social networks, enable online orders and track such orders. In 2018, 77% of the enterprises in the European Union had their own website, and since 2012, that share has increased by 6% (Figure 1). The following countries have demonstrated a share of the enterprises having their own website higher than 90%: Sweden (92%), Finland (96%), Denmark (96%), as well as the Benelux countries - Belgium (84%), the Netherlands (94%) and Luxembourg (83%). The large, developed European economies, such as Germany (87%) and the United Kingdom (82%), as well as the Czech Republic (83%), have a high share of the enterprises with their own website, whereas France (69%), Italy (71%) and Spain (76%) have shown a share of the enterprises that have a website of their own below the European average. The lowest share of the enterprises having a website of their own is found in Latvia (63%), Romania (44%), Bulgaria (51%) and Hungary (66%).

Another important indicator of the infrastructure development is the speed of the Internet connection. In 2018, 20% of the EU-28 enterprises had an Internet connection speed ranging from 2 to 10 Mb/s, 24% of the enterprises were within the range from 10 to 30 Mb/s, and 25% of the enterprises were within the range from 30 to 100 Mb/s, with a connection speed greater than 100 Mb/s in 18% of the enterprises (Figure 2). The share of the enterprises that use a slower Internet connection has been declining for the past five years, while the share of the enterprises that use a higher connection speed has been increasing. This trend is present in most countries, regardless of the enterprise structure in terms of the connection speed.

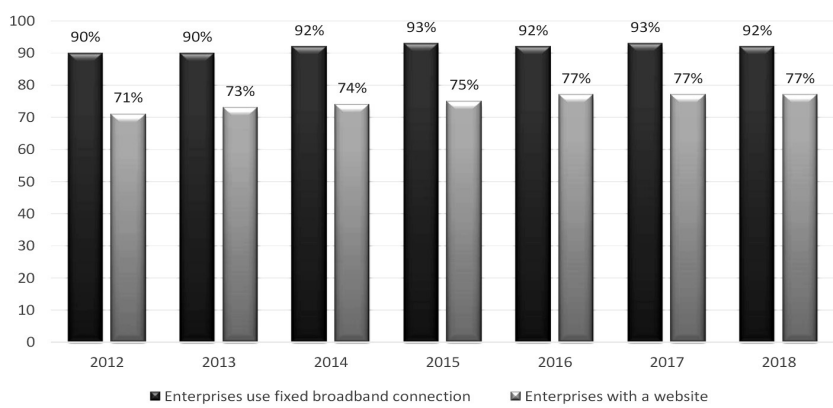

Figure 1 The enterprises using a broadband internet connection and the enterprises having a website of their own, EU-28, 2012-2018 (% of the enterprises)

Source: Authors

One of the most important aspects of using the Internet in enterprises pertains to the use of social media. The types of social media are: social networks, multimedia content sharing sites (Youtube, Flickr, Picassa), the enterprises blog (Twitter), and wiki data sources. In several European countries, more than 50% of the enterprises used social media in 2017 (Finland - 63%, Sweden - 65%, the Netherlands - 68%, Belgium - 58%, Luxembourg - 54%), whereas in the others, the share of these enterprises was around or even below 30% (Bulgaria - 34%, Romania - 35%, Hungary - 38%, Poland - 27%, the Czech Republic - 36%, Slovakia - 39%).

How social media are used by enterprises and how many enterprises use social media is best seen when using social networks. The smaller the country, the farther away from large European markets, the harder it is to reach and interact with customers on these markets, the greater is the share of the enterprises that use social networks in their operations. Thus, the largest share of the enterprises using social networks in 2017 is found in small island countries - Malta (73%), Ireland (67%), Cyprus (65%), as well as Denmark (67%), the Netherlands (66%), Sweden (63%), as well as in the United Kingdom, where the share of the enterprises using social networks is 60%. All these countries have a share of the enterprises that use social networks higher than the average of 45% for the European Union as a whole. At the same time, enterprises in large European economies, in Central European countries, do not rely that much on social networks in their business doing, for which reason the share of the enterprises using social networks in these countries is below the EU-28 average and is 39% in France, 40% in Germany, 42% in Italy, and slightly above the European average - 49%, in Spain. Enterprises in these economies have other ways to reach customers and the common European market; moreover, they make up that market (or at least most of it).

The lowest share of the enterprises using social networks in their business doing is recorded in Hungary (36%), Slovakia (35%), Bulgaria (34%), the Czech Republic (34%), Romania (34%), Latvia (29%), and Poland (26%). Again, these are Central and Eastern European countries, the former countries in the process of transition to the market economy. N. Roztocki and H. R. Weistroffer (2008), said that the social and economic characteristics of these countries and the level of economic development and business culture would reflect on the adoption and application of ICT. From the IT infrastructure, via the Internet usage and a website ownership, to communication with customers via social networks, these countries are still lagging behind developed European economies. P. Soja and P. R. Cunha (2015) summarize

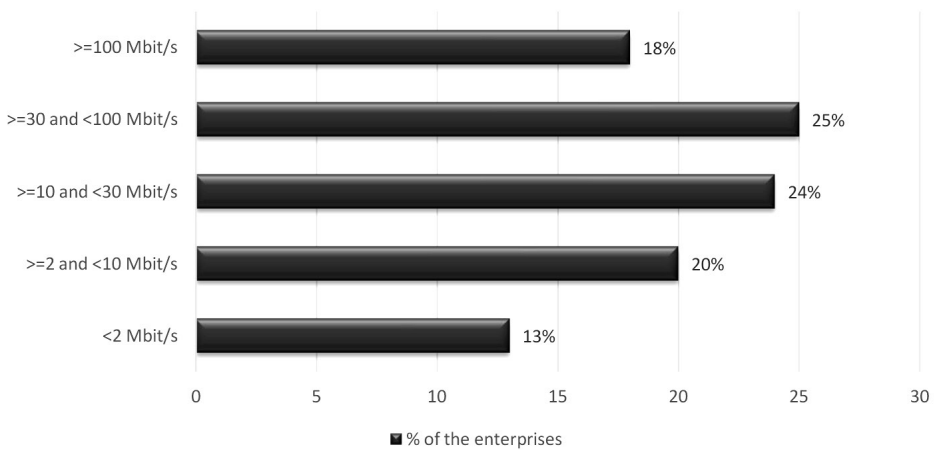

Figure 2 The Internet connection speed in the EU-28 enterprises, 2018.

Source: Authors

the characteristics of ICT implementation in these countries: a lack of a long-term strategic framework for ICT implementation, a low level of ICT usage, the need for foreign support in ICT adoption, the impact of foreign investment on ICT, an inadequate customer orientation, inadequate planning, limited resources, problems in education and the acceptance of ICT by employees.

Cloud computing services are different types of the ICT services accessed via the Internet, for example, email services, the storage of files, office software (Word, Excel), enterprise database hosting, financial or accounting software applications, the use of customer relationship management software (Customer Relationship Management - CRM), increasing the computer capacity to run enterprise software (Figure 3). At the EU-28 level in 2018, 26% of the enterprises used cloud computing services. Norway (51%), Sweden (57%) and Finland (65%) led in the use of these services, whereas Bulgaria (8%), Romania (10%) and Poland (11%) had the lowest share of the enterprises using cloud computing services. Slovakia (21%) and Hungary (18%) are slightly closer to the European average. Large European economies, France (19%), Germany (22%), Spain (22%) and Italy (23%) are below the European average, whereas small economies and island countries, such as Ireland (45% of the enterprises), Malta (37% of the enterprises) and Croatia (31%) seek to improve their IT performances by using cloud services.

As with the use of social networks, it is shown once again, and this time on the example of cloud computing, that the size of a country may not be crucial in terms of adopting new technology and the implementation of ICT (Figure 4). Small European countries are also achieving significant results in implementing ICT (Zečević & Radović-Stojanović, 2017).

Eurostat has been collecting e-commerce indicators since 2010, when the first e-commerce data in the Eurostat Database appeared. The level achieved in e-commerce development in the countries will be analyzed on the basis of the share of the enterprises selling their products online and the share of e-commerce in the total turnover of the enterprises. Online sales involve receiving orders using the methods specifically designed for receiving orders, such as Electronic Data Interchange (EDI), the website, or special applications (orders received via e-mail are not included) (Eurostat, 2018). The Internet sales indicator in the Eurostat Database is the share of the enterprises receiving electronic orders (Figure 5).

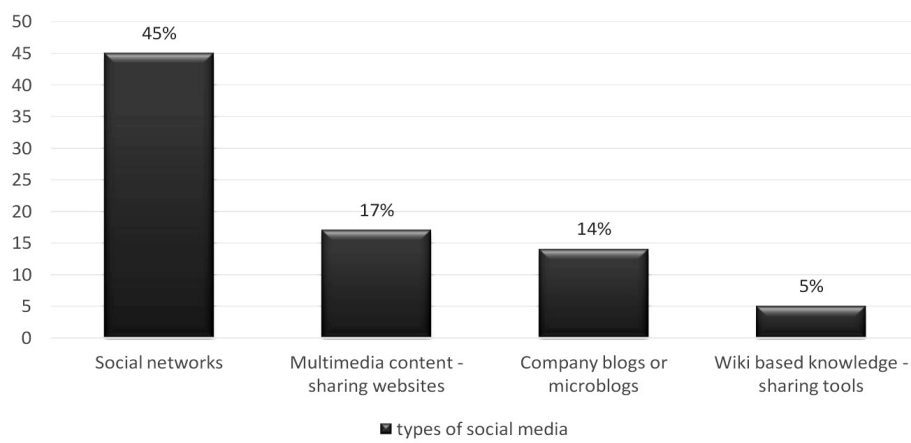

Figure 3 The use of social media in the EU-28 countries, 2017 (% of the enterprises)

Source: Authors

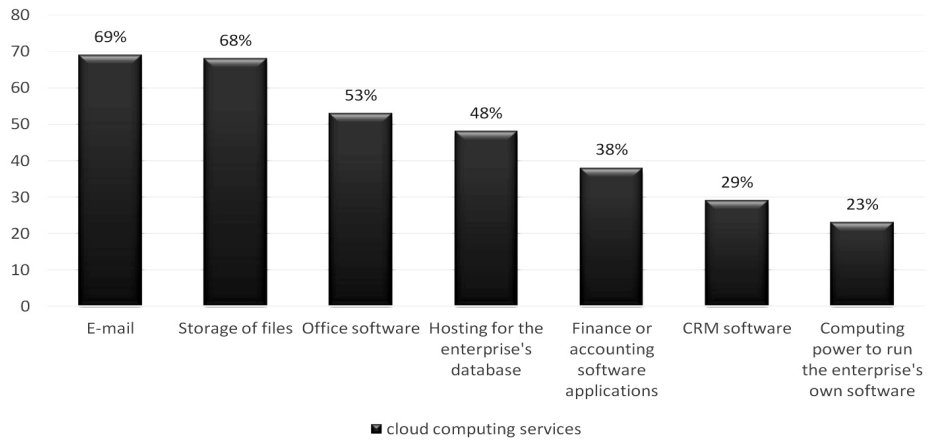

Figure 4 Cloud computing services in the European countries, EU-28, 2017 (% of the enterprises)

Source: Authors

In 2018, 20% of the enterprises in the EU-28 countries sold their products online. The share of online sales in the total turnover of the enterprises was 17%. E-commerce has grown in recent years in almost all European Union countries, with the largest share of the enterprises selling electronically being in the Scandinavian countries, i.e. in Denmark (32%), Norway (29%) and Sweden (32%), as well as in the Benelux countries, i.e. in Belgium (30%) and the Netherlands (27%), though not in Luxembourg (only 16%). E-commerce is also developed in the island countries, i.e. in Iceland (29%), Ireland (35%) and Malta (22%). As expected, Bulgaria (8%), Latvia (13%), Romania (9%), Poland (14%), Slovakia (16%), Hungary (15%), as well as Greece (12%), are below the European average. The major European economies are generally around the EU-28 average, with the exception of Italy (only 14%), so the share of the enterprises selling online in Germany is 22%, in France 19%, and in Spain 20%.

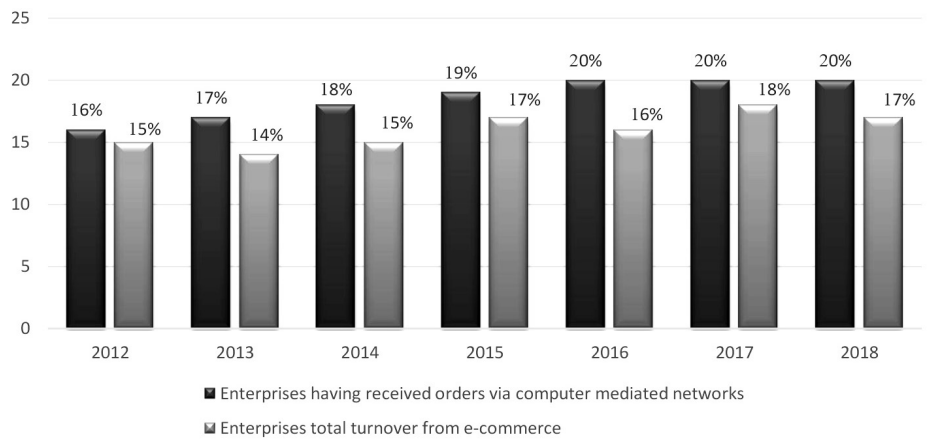

Figure 5 The share of the enterprises receiving electronic orders and the share of e-commerce in the total turnover, EU-28, 2012-2018 (% of the enterprises)

Source: Authors

In some cases, a significant share of electronic turnover (online sales) is held by the enterprises in the countries that already have a large share of the enterprises selling online, such as Sweden (24%), Denmark (23%) and Finland (21%), but it is also the case that the countries with a smaller share of the enterprises selling online make a large share of electronic turnover in the total turnover. For example, Slovakia, where only 16% of the enterprises sell electronically, has a 21% share of electronically generated turnover. On the other hand, the low share of electronically generated turnover is in the Netherlands (15%) and Luxembourg (also 15%) and in some large European economies as well, which would be expected to be quite the opposite since they already have a significant share of the enterprises selling online. For example, the share of electronically generated turnover in Germany is only 14% and in Italy 11%. The lowest share of electronically generated turnover is in Bulgaria (5%), Latvia (6%), Romania (9%) and Poland (15%).

E-business integration is monitored on the basis of the share of the enterprises using Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and the Supply Chain Management (SCM) software applications. ERP software integrates all departments and functions through a single IT system (or an integrated set of IT systems) in order to enable decision-making, encompassing all business operations (Zečević, 2015). CRM software integrates customer relationships, facilitates communication and business operations, and promotes sales through customer monitoring and supervision. SCM software manages information in the supply chain so as to improve supply and to better meet customer needs. The application of these pieces of software is an indicator of the degree of e-business integration in enterprises.

Seen at the EU-28 level in 2017, 34% of the enterprises used ERP integrated business software; CRM software applications were used by 33% of the enterprises, and 18% of the enterprises created prerequisites for integrating with customers and managing the supply chain through the SCM software application. Considering that the Eurostat Database has only the 2017 data on CRM and SCM, Figure 6 only shows the share of the enterprises that use ERP software in the 2012-2017 period.

The use of ERP software is expected to highlight large, developed European economies, namely Germany (38%), France (38%), Italy (37%), Spain (46% of the enterprises), and ERP software is now used for e-business integration in some smaller countries as well, such as Greece (37%) and Slovakia (31%), which

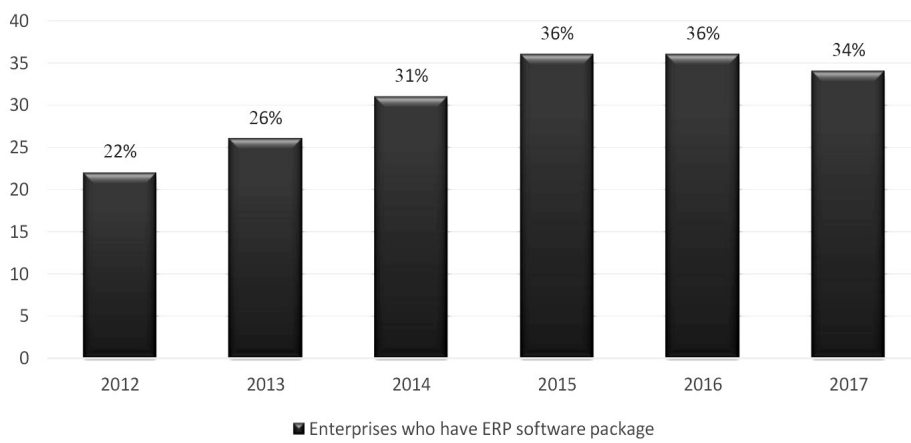

Figure 6 Using ERP software, EU-28, 2012-2017 (% of the enterprises)

Source: Authors

do not stand out by the value of the other indicators observed. Hungary (14%), Romania (17%), Bulgaria (23%), Poland (26%), as well as Iceland (14%), have a slightly lower share of the businesses using ERP software. In terms of using CRM software, Germany (46% of the enterprises) and Austria (43%), as well as the Benelux countries - Belgium (42%), Netherlands (46%) and Luxembourg (39%) - are in the lead, whereas Romania (13%), Latvia (15%), Hungary (13%), Bulgaria and the Czech Republic (18%) have only just begun to introduce CRM software. The case is similar with the use of SCM software, with Germany (30%), Belgium (26%), Finland (22%), Lithuania (28%) being ahead, whereas Hungary (9%), Romania (7%) and Latvia (6%) are lagging behind in terms of SCM software.

CONCLUSION

The study has confirmed the research hypothesis - that the differences between the member states have an impact on the level achieved in the adoption and implementation of information and communication technologies in enterprises in the EU countries. Comparing the values of ICT usage indicators, on the one hand, and the characteristics of the countries, on the other, the four factors that influence the usage of ICT in enterprises have been identified, namely: the regional position, the geographic characteristics, the size of the country and the level of the economic development achieved. The regional position of the countries determines the proximity of large markets and influences how companies communicate with customers. The geographic characteristics of the country may be an incentive for a better adoption and application of information technology in enterprises. The regional position and the geographic characteristics, however, may be the limiting factors in some cases, when the development of the ICT infrastructure is concerned. The size of the country is also important, but not as might be expected, in the sense that large, developed economies achieve the best performance in the implementation of ICT. On the contrary, small and dynamic European economies seek for development opportunities in ICT and often outperform large, developed economies by the value of ICT usage indicators. The level of the achieved economic development is an important factor because of the amount of investment in information technology, the development of information business culture and the willingness of enterprises to adopt information and communication technology. The level of development also influences the adoption of advanced information technology, such as cloud computing and e-business integration in enterprises. Additional research is needed to specify the impact of these four factors and for the possible identification of the other factors that affect the use of information and communication technologies in enterprises.

The regional grouping of the countries encountered in the literature (east/west, north/south) largely reflects a country's specifics and differences between countries, but the same needs to be more profiled and should be complemented by an analysis of the geographic characteristics of the countries. Therefore, there is still plenty of room for research, as regional generalizations are often not enough to make differences between the countries. The regional grouping of the countries needs to be further deepened by their geographic features and the level of the development achieved. A narrow classification of the countries is possible according to specific geographic features (e.g. island countries) or according to how they share the common economic history (Central and Eastern European countries, former transition countries) and economic and political interests (the Benelux countries, the Scandinavian countries). A more detailed analysis is needed to fully explore and appreciate the geographic specifics of the countries.

The level of the economic development of the countries is related to the development of the IT infrastructure and investment in ICT. The IT infrastructure is the basis of every ICT usage, so the countries with the low indicators of the infrastructure development often have the other indicators of ICT usage at a low level. However, some countries are still struggling to overcome their limitations in the infrastructure

development. This is, for example, the case with some island countries, whose enterprises manage to communicate with customers through ICT and successfully integrate ICT into their businesses. This is also the case in some Central and Eastern European countries, whose enterprises, despite their modest infrastructure capacity, strive to keep their connection speeds above the average and use what they have at their disposal. In some cases, the infrastructure development constraints cannot be overcome, so the low value of the advanced technology indicators - the use of cloud computing and e-commerce services - is observed in the countries with lower IT infrastructure development indicators.

The Benelux countries, i.e. Belgium, the Netherlands and Luxembourg, have adopted new e-commerce-based business and customer communication models and are leading the way in almost all the indicators. The situation is similar with the Scandinavian countries, which are above the European average in almost all of the observed indicators. Enterprises in small EU countries and the island countries are particularly leading in the use of social media, while in the Central and Eastern European countries the use of social networks and social media has not yet become an integral part of business. Regarding the use of ERP, SCM, and CRM software in enterprises, their use is still uneven across countries. These are technological solutions and ways of communication with customers that those enterprises have just started adopting both in the small and in the large European economies.

REFERENCES

Becker, J., Becker, A., Sulikowski, P., & Zdziebko, T. (2018). ANP-based analysis of ICT usage in Central European enterprises. Paper presented at the 22nd International Conference on Knowledge-Based and Intelligent Information, & Engineering Systems. *Procedia Computer Science*, 126, 2173-2183. doi.org/10.1016/j.procs.2018.07.231

Bouwman, H., van der Hooff, B., van der Wijngaert, L., & van Dijk, J. (2005). Information and Communication Technology in Organizations: Adoption, Implementation, Use and Effects. Amsterdam, NI: Boom.

Chroneos-Krasavac, B., Soldic Aleksic, J., & Petkovic, G. (2016). The big data phenomenon: The business and public impact. *Industrija* 44(2), 117-144. doi:10.5937/industrija44-10036

European Commission. (2017). *Europe's Digital Progress Report 2017. Brussels, 10.5.2017 SWD 160 final*. Retrieved March 17, 2019, from htt://ec.europa.eu/digital-single-market/en/news/europes-digital-progress-report-2017

European Commission. (2019). *Digital Economy and Society Index Report 2019 Connectivity*. Retrieved May 14, 2019, from http://ec.europa.eu/digital-single-market/en/news/digital-economy-and-society-index-desi-2019

Eurostat. (2018). *ICT usage and e-commerce in enterprises, Methodological Manual for statistics on the Information Society*. Retrieved April 05, 2019, from http://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp

Real, J. C., Leal, A., & Roldán, J. L. (2006). Information technology as a determinant oforganizational learning and technological distinctive competencies. *Industrial Marketing Management*, *35*, 505-521. doi:10.1016/j.indmarman.2005.05.004

Roztocki, N., & Weistroffer, H. R. (2008). Information Technology in Transition Economies. *Journal of Global Information Technology Management, 11*(4), 2-9. doi:10.1080/1097198x.2008.10856476

Roztocki, N., & Weistroffer, H. R. (2015). Information and Communication Technology in Transition Economies: An Assessment of Research Trends. *Information Technology for Development*, *21*(3), 330-364.

Roztocki, N., Soja, P., & Weistroffer, H. R. (2019). The role of information and communication technologies in socioeconomic development: Towards a multi-dimensional framework. *Information Technology for Development*, *25*(2), 171-183. doi.org/10.1080/02681102.2019.1596654

Soja, P., & Cunha, P. R. (2015). ICT in transition economies: Narrowing the research gap to developed countries. *Information Technology for Development*, *21*(3), 323-329. doi/full/10.1080/02681102.2015.1028734

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. doi:10.2298/eka1506045S

Stankić, R., & Stojković, D. (2017). The use of information and communication technologies in the business operations of Serbian enterprises. *Ekonomske ideje i praksa*, 27. doi:10.5937/EKOPRE1706393Z

Stankic, R., Jovanovic Gavrilovic, B., & Soldic Aleksic, J. (2018**).** Information and communication technologies in education as a stimulus to economic development. *Economic Horizons*, *20*(1), 59-71, doi:10.5937/ekonhor1801061S

United Nation. (2018). *Measuring the Information Society Report 2017 Volume 2. ICT country profiles*. Retrieved May 17, 2019, from https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_Volume2.pdf

World Economic Forum. (2016). *The Global Information Technology Report 2016*. Retrieved April 20, 2019, from http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf

Zečević, A. (2015.) Baze podataka u poslovanju. Beograd, RS: Zadužbina Andrejević.

Zečević, A., & Radović Stojanović, J. (2017). The Use of Information and Communication Technologies in Enterprises in Serbia. *Ekonomika preduzeća*, *45*(5-6), 393-403. doi:10.5937/ekopre1706393z

Zečević, A., & Radović Stojanović, J. (2018). The Use of Information and Communication Technologies in Enterprises in the Region: Level Achieved and Further Development. In S. Drezgić, S. Živković, & M. Tomljanović (Eds.). *Economics of Digital Transformation* (pp. 177-194). Rijeka, Croatia: University of Rijeka, Faculty of Economics and Business in Rijeka.

Received on 7th August 2019,
after revision,
accepted for publication on 23rd December 2019

Published online on 25th December 2019

Aleksandra Zecevic is an associate professor at the Faculty of Economics, University of Belgrade where she obtained her PhD. She teaches Databases, Programming Languages, New Information Technology at bechalor and master studies. Her fields of expertise are: databases, programming, and e-commerce.

Jelena Radovic-Stojanovic is an assistant professor at the Academy of Criminalistic and Police Studies in Belgrade. She obtained her PhD at the Faculty of Economics, University of Belgrade. She teaches Fundamentals of Economics, Public Finance, and Information Systems in Economics. Her research areas include macroeconomics and the economic policy, economic statistics, and business informatics.

Aleksandar Cudan is an associate professor at the Academy of Criminalistic and Police Studies in Belgrade. He obtained his PhD at the Faculty of Economics in Subotica, University of Novi Sad. He teaches Economic Crime, Information System Management and Information Systems in Economics.

APPENDIX

Table 1 The indicators of ICT implementation in enterprises (% of the enterprises), EU-28, 2017-2018

country/ indicator	Enterprises use DSL or another fixed broadband connection (2018)	Enterprises with a website (2018)	Enterprises using social media (2017)	Enterprises using social networks (2017)	Buying cloud computing services (2018)	Enterprises having received orders via computer mediated networks (2018)	Enterprises' total turnover from e-commerce (2018)	Enterprises which have ERP software package	Enterprises using CRM (2017)	Enterprises using SCM (2017)
Austrija	90	88	53	51	23	18	14	40	43	16
Belgija	96	84	58	57	40	30	32	54	42	26
Bugarska	84	51	34	34	8	8	5	23	18	17
Češka	97	83	36	34	26	25	29	28	18	12
Danska	100	96	68	67	56	32	23	40	36	23
Estonija	98	78	40	39	34	20	15	28	23	15
Finska	97	96	63	61	65	24	21	39	37	22
Francuska	94	69	41	39	19	19	22	38	27	13
Grčka	84	65	50	49	13	12	4	37	18	10
Holandija	99	94	68	66	48	27	15	48	46	19
Hrvatska	92	73	45	41	31	18	12	26	19	19
Irska	93	79	68	67	45	35	35	28	31	12
Italija	91	71	44	42	23	14	11	37	29	11
Kipar	94	71	67	65	27	14	4	35	42	17
Letonija	81	63	30	29	15	13	6	25	15	6
Litvanija	96	78	50	47	23	22	13	47	33	28
Luksemburg	97	83	54	52	25	16	15	41	39	18
Mađarska	83	66	38	36	18	15	23	14	13	9
Malta	94	82	73	73	37	22	:	29	24	11
Nemačka	93	87	45	40	22	22	14	38	46	30
Poljska	87	67	27	26	11	14	15	26	23	21
Portugalija	96	63	46	45	25	19	18	40	24	17
Rumunija	82	44	35	34	10	9	9	17	13	7
Slovačka	89	76	39	35	21	16	21	31	22	15
Slovenija	99	84	47	45	26	25	17	30	25	15
Španija	91	76	51	49	22	20	17	46	34	17
Švedska	93	92	65	63	57	32	24	31	34	13
Ujedinjeno Kraljevstvo	93	82	63	60	42	22	19	19	31	12

Source: Authors

Table 2 The ranking of the enterprises by the value of ICT usage indicators in the enterprises, EU-28, 2017-2018

	Enterprises use DSL or another fixed broadband connection (2018)	Enterprises with a website (2018)	Enterprises using social media (2017)	Enterprises using social networks (2017)	Buying cloud computing services (2018)	Enterprises having received orders via computer mediated networks (2018)	Enterprises' total turnover from e-commerce (2018)	Enterprises which have ERP software package	Enterprises using CRM (2017)	Enterprises using SCM (2017)
Austrija	21	5	11	11	18	18	19	7	3	14
Belgija	8	7	9	9	7	4	2	1	4	3
Bugarska	24	27	26	26	28	28	25	25	23	10
Češka	5	9	24	24	12	6	3	19	24	20
Danska	1	1	2	2	3	2	5	6	8	4
Estonija	4	14	21	21	9	13	14	20	19	15
Finska	7	2	7	7	1	8	9	9	7	5
Francuska	11	21	20	20	22	15	7	11	15	18
Grčka	25	24	13	13	25	26	26	12	25	25
Holandija	2	3	4	4	4	5	16	2	2	8
Hrvatska	18	18	18	18	10	17	21	22	22	7
Irska	15	13	3	3	5	1	1	21	12	21
Italija	20	19	19	19	16	22	22	13	14	23
Kipar	12	20	5	5	11	23	27	14	5	12
Letonija	28	25	27	27	24	25	24	24	26	28
Litvanija	9	15	14	14	17	10	20	3	11	2
Luksemburg	6	10	10	10	14	19	15	5	6	9
Mađarska	26	23	23	23	23	21	6	28	27	26
Malta	13	11	1	1	8	11	28	18	17	24
Nemačka	14	6	17	17	19	9	18	10	1	1
Poljska	23	22	28	28	26	24	17	23	20	6
Portugalija	10	26	16	16	15	16	11	8	18	13
Rumunija	27	28	25	25	27	27	23	27	28	27
Slovačka	22	17	22	22	21	20	8	15	21	17
Slovenija	3	8	15	15	13	7	13	17	16	16
Španija	19	16	12	12	20	14	12	4	9	11
Švedska	16	4	6	6	2	3	4	16	10	19
Ujedinjeno Kraljevstvo	17	12	8	8	6	12	10	26	13	22

Source: Authors