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INFORMATION TECHNOLOGIES, EDUCATION AND SKILLS FOR IT JOBS CHALLENGES

Original Scientific Article

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Abstract:

The aim of the research is to contribute to the theoretical and practical measuring ICT skills shortages on the domestic labour market. Serbian ICT industry is taken as a case study. Key findings show that the country needs to ensure that its education system, policy settings and business practices are all working towards equipping the country's workers with the required basic and new technological, digital skills. This will ensure that the Serbian workforce is well-placed to meet the future challenges associated with digital disruption. To the usually proxied way by various measurements and concepts, while reliable and consistent data are often scarce, the efforts of the authors are built around quantitative indices or qualitative, assessment of the future needs of ICT skills of the labour market.

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The paper contributes to an innovative risk-based approach to identifying skills shortages and surpluses, listing ICT occupations that have been prioritized and discusses through the sector analysis the reasons underlying these mismatches and attempts that are possible to tackle them.

Keywords: e-Skills, ICT skills shortage, Industry ICT graduate skill requirements

Jel Classification: I23

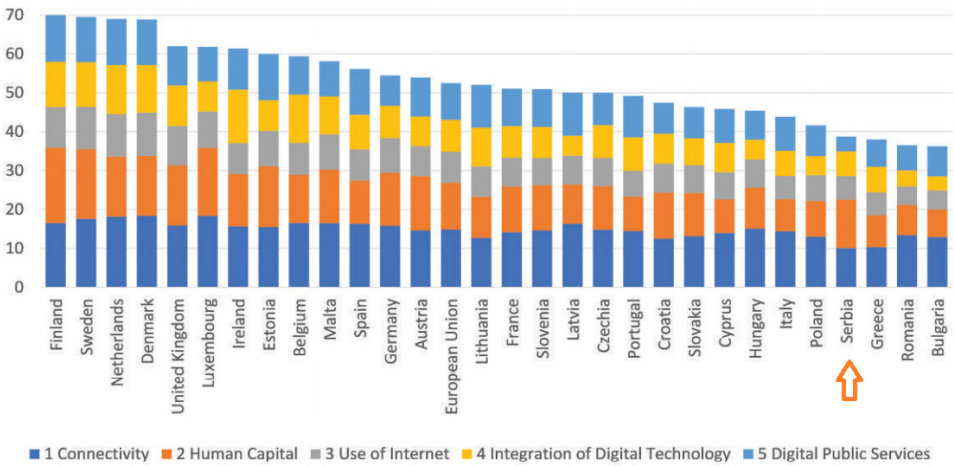
1. INTRODUCTION

This research assesses the potential of the ICT Serbian industry, taking into consideration the internal industry constituents, the growing trend of internationalization, and the match of skills and education with the actual market needs. For this is used background literature and desk research results and specific made SWOT analysis of various indicators in regard to the Serbian ICT sector challenges.

Motivation for the research is ICT industry as one of the key driving forces of contemporary competitiveness and a means to create positive spillovers to other economic sectors and achieve cross-innovation. ICT sector in the European economy represents 4.8% of the entire European economy, generates 25% of total business expenditure in research and development. According to the Global Information Technology Report (2020) the global information technology market is \$11866.34 billion and expected to grow to in 2025 at a CAGR of 9%. An additional 395,000 new jobs will be created as employment is projected to grow by a further 11 per to 2030, with 1.6 million ICT professional jobs that will need to be filled to 2030.

Serbia as case study country in this research has recorded the strongest growth of ICT sector which was supported by European Union (DESI rank for Serbia is given in figure 1).

Figure 1. DESI for all European countries, including Serbia, by categories, 2019



Source: RATEL, 2019.

A possible lack of adequate ICT/digital skills may not only hamper the diffusion of ICT but also exacerbate the risk of job losses related to automation. Such growth may increase already heavy pressure on supply of ICT professionals as they are among the most demanded workers in the EU. The same is for Serbia. They are a shortage occupation in twenty-four EU Member States and a surplus in the Netherlands. In addition to new jobs, replacement demand is expected to vacate around 1.5 million jobs, quadrupling the total demand for ICT professionals until 2025. A comparison of possible missing workforce in this field is illustrated in table 1

Table 1. Missing workforce according to enrolled ICT students in EU and Serbia, until 2023 estimates

		ICT students 2017	Needs until 2023	Missing numbers in 2023
TOP_5 EU-15	West EU	329,884	438,000	108,116
THE REMAINING_10 EU-15	West EU	329,884	438,000	108,116
EU-13	East EU	283,901	349,000	65,099
EU-28	Total EU	1,474,543	1,989,000	514,457
TOTAL SERBIA		25,817	18,000	-7,817

Source: According to EUROSTAT, data 2019.

The most important sources of companies' competitive position in the software industry in Serbia are specialized expertise, programming skills, reputation and quality products and services. In addition to this, strengths also come from good price-quality ratio (with a view to average wages) and cultural proximity to European clients. The most of the ICT companies in Serbia define workforce as highly qualified, well-educated and having innovative spirit. Other main strengths include labor cost, companies' flexibility, language skills and cultural similarities with the West. The prices of the services offered by the software companies in the global market are highly competitive, having in mind acknowledged quality, excellent coding competencies and established reputation. Combined with agility and flexibility of IT experts, a good command of the English language and a higher degree of cultural proximity to the Central Europe than other outsourcing destinations, these attributes provide Serbia with strong boost in terms of international competitiveness.

2. LITERATURE REVIEW

IT job titles in the information technology sector there are many. From programming and database creation to providing general technical or help desk support, there are roles for people with a variety of areas of interest, and many levels of expertise. Most important IT skills employers look for are: coding, networks, communication, time management. The most common job titles from the IT industry are:

- *Cloud Computing- Engineer, Architect, Consultant, Product and Project Manager, Cloud Services Developer, Software and Network Engineer, Cloud System Administrator,*
- *Information Security Specialist,*
- *Web Developer,*
- *Software/Application Developer,*
- *Information Technology Leadership,*
- *Computer Support Specialist-Administrator, Manager, Technician, IT Support Manager/ Specialist, Systems Administrator, Technical Support Engineer/ Specialist,*
- *Database Administrator-Data Center Support Specialist, Quality Manager,*
- *Computer Network Specialist and analysts bachelor's/ master's degree in business administration (MBA), with a focus on information systems- Computer and Information Research Scientist, Systems Manager, Architect, Analyst, IT Analyst, IT Coordinator, Network Administrator, Network Architect, Systems Administrator, Telecommunications Specialist,*
- *Information Technology Analyst.*

Table 2. Most important IT skills employers looked for in 2020.

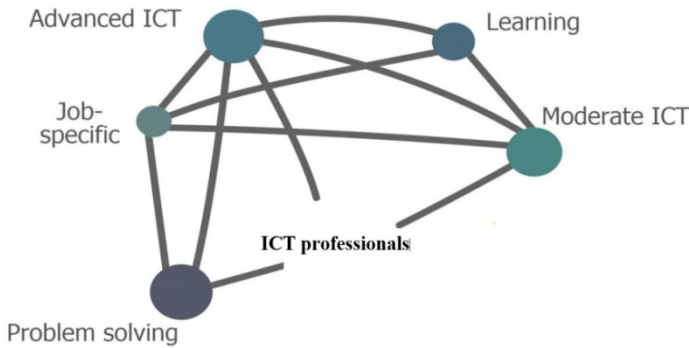
Coding Skills	Communication Skills	Knowledge and Computer Networks	Time and Project Management
– PHP	– Team Building	– IP Setup	– Scheduling
– Python	– Teamwork	– Wireless Modems/Routers	– Goal Oriented
– Java	– Leadership	– Cloud Services	– Digital Communications
– JavaScript	– Collaboration	– PHP	– Manage Remote Working Teams
– Application Development	– Written Communication	– SQL	– Continually Review Processes for Improvement
– Cloud Computing	– Oral Communication	– JavaScript	– Multitasking
– HTML	– Active Listening	– Python	– Meeting Deadlines
– Artificial Intelligence Architecture	– Communicating Complex Information in Digestible Amounts	– C++	– ICT (Information and Communications Technology)
– C++		– Functionality	
– C Language		– Cyber Security	
– UX Design		– Information Management	
– Ruby		– Cloud Systems Administration	

In-demand IT Skills

- Assign Passwords and Maintain Database Access
 - Analytical
 - Analyze and Recommend Database Improvements
 - Analyze Impact of Database Changes to the Business
 - Audit Database Access and Requests
 - APIs
 - Application and Server Monitoring Tools
 - Attention to Detail
 - AutoCAD
 - Azure
 - Configure Database Software
 - Configuration Management
 - Critical Thinking
 - Database Administration
 - Deploying Applications in a Cloud Environment
 - Develop and Secure Network Structures
 - Develop and Test Methods to Synchronize Data
 - Emerging Technologies
 - File Systems
 - Implement Backup and Recovery Plan
 - Implementation
 - Information Systems
 - Interaction Design
 - Interaction Flows
 - Install, Maintain, and Merge Databases
 - Integrated Technologies
 - Integrating Security Protocols with Cloud Design
 - Internet
 - Optimization
 - IT Soft Skills
 - Logical Thinking
 - Leadership
 - Operating Systems
 - Migrating Existing Workloads into Cloud Systems
 - Mobile Applications
 - Open Source Technology Integration
 - Optimizing Website Performance
 - Problem Solving
 - Project Management
 - Software Engineering
 - Software Quality Assurance (QA)
 - TensorFlow
 - User-Centered Design
 - UI / UX
 - Visual Basic
 - Visual FoxPro
 - Web Development
 - Web Design
- The five key skills required for ICT professionals are:**
- Advanced ICT skills,
 - Problem solving,
 - Moderate ICT skills,
 - Learning and
 - Job-specific skills.

ICT professionals are a high-skilled occupation: in 2015, seven out of 10 people held high qualifications and about one quarter of them hold medium-level qualifications.

Figure 2. Most important skills required for ICT professionals



Source: Authors according to Cedefop's European skills and jobs survey (ESJS)

Aside from IT technology and information services, rising ICT intensity will increase demand for these professionals namely in warehousing and postal services, in financial services and in real estate, professional, scientific and technical activities. New ICT skills and demand would be connected with outsourcing, further digitalization of economy, big data, cloud computing, automation, Internet of things and smart solutions.

Table 3. New ICT skills

Advancements in data scientists, managing supply chains, deep knowledge of these sectors			Advancements in cloud-based services, artificial intelligence, and mobile devices have polarised demand for ICT skills. ICT technicians - a role in supporting the well-functioning of the advanced computer systems and networks.			
Out-sourcing	Further digitalization of economy	Big data trend	Cloud computing	Automation	Internet of Things	Smart systems
<ul style="list-style-type: none"> -managing of supply chain in the context of ICT 	<ul style="list-style-type: none"> -developing efficient, -custom-built ICT solutions for any company or organization -health-care providers -sewage network companies t -farms and logistics companies. 	<ul style="list-style-type: none"> -strong data analytical skills -skills for scaling -scaling for managing the data for enterprises -New occupations: data scientists, data managers, and chief data officer 	<ul style="list-style-type: none"> -Reduces technical, increase the knowledge on services to cloud, -service integration, -service management, -designing and managing clouds, -building and optimising cloud data centres 	<ul style="list-style-type: none"> -Robots, virtual personal assistants, autonomous vehicles -software and hardware expertise -numeracy and domain knowledge 	<ul style="list-style-type: none"> -Architecture and design, -knowledge of and skills in handling diversified systems, -Understanding of standardisation and interoperability between connected (and to-be-connected) systems. -Technical knowledge of IoT networks, -management of the multiple network configurations - part of IoT networks skills 	<ul style="list-style-type: none"> -Advancements in artificial intelligence, cloud-based services and most of all mobile devices have polarised demand for ICT skills. -data science -analytics skills, -business acumen -cyber-security skills -Interconnected “smart” infrastructure systems of the future.

Source: Authors’ calculations

3. IT SECTOR IN SERBIA OVERVIEW

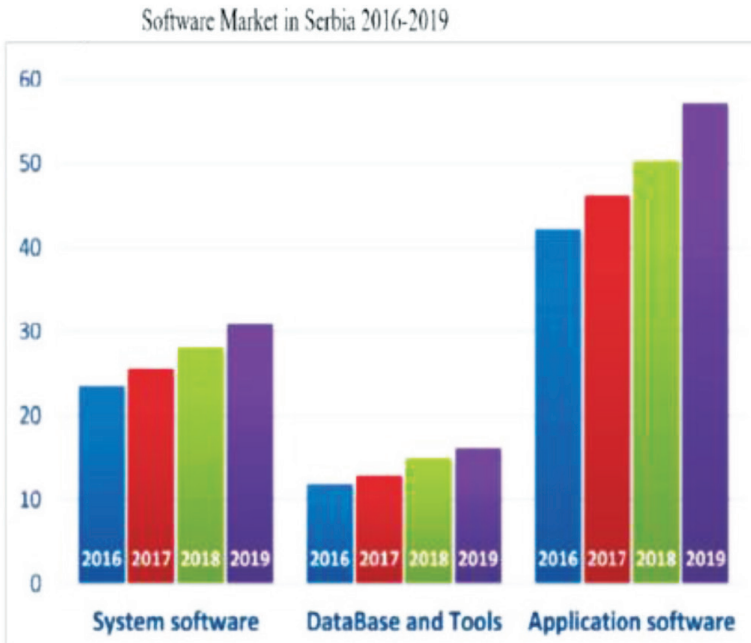
In Serbia IT market generated in 2019 (SITO 2019), revenues of €578 million (around 6% of GDP) which provides a yearly growth of 7.3%, and for IT service 42.1%. The software 18.1%, IT industry net profit is generated by the companies from the Software sector, (59.8%). In the period from 2014-2019, the application software market rose from €38.1 to €57.2 million. The average annual growth rate in the observed period was 8.5%. This market is expected to continue to grow at an annual rate of more than 10% until 2025 (figure 3&4).

IT services export was €1.02 billion (2.4% of GDP) as higher by 25.8% than in the same period last year. Outsourcing is being one of the strongest performing categories with 30% annual growth rate. The IT market is expected to reach a value of RSD217.7bn (USD2bn) by 2024, suggesting an average uptick of 7.5% y-o-y over the 2021-2024 period. Serbia has had the highest export shares of ICT goods and services among the Western Balkan economies (European Commission 2018)

Figure 3 & 4. Serbian IT market (2015-2019 %)



Source: According to data of Vojvodina ICT Cluster, 2020.



Source: SITO, 2019

The revenue from IT business would amount to nearly 2 billion euros, while the remaining half a billion comes from IT related or non IT activities in the sector. On the other hand, growth of domestic IT market was around 10%, which means that the growth coming from IT-related and non IT activities in the IT sector was stronger than the growth of domestic IT market.

Software export growth rate is considerably higher than that of the domestic IT market. The highest business revenue in the IT industry comes from software sub-sector with 37% of total revenues. Considering size, small and medium IT companies together make €1.45 billion, which is 70% of total IT industry revenue. The remaining 30% is evenly distributed among micro and large enterprises.

The Telecommunication market has amounted in 2018 to €1.68 billion (3.9% of GDP), the total investments amounted to €352.8 million, where 58.2% goes to the mobile market, the largest share whereas Media content distribution with 12.1% represents the smallest share (RATEL 2019). Investments in the mobile market have the largest share in the total revenues, 40.8% in 2018, whereas investments in CATV 23.8%. The total income earned from providing Internet services reached RSD 25.9 billion (around €219 million) in 2018, which is the growth of 8% compared to 2017. The income was ten times multiplied in comparison to the year 2006 when the data were recorded for the first time. Internet Operators. A total of 194 Internet operators were registered in Serbia by December 2018, approximately 20% lower than it had been in 2011. Internet Penetration: In 2018, the number of broadband Internet connections per 100 citizens was approximately 77 and the number of fixed broadband Internet connections per 100 citizens approximately 23. Broadband Internet Penetration: Unless 3G mobile network subscribers are taken into consideration, the penetration of fixed broadband Internet access amounts to 23%, which is above average in the SEE region (18.0%). However, the penetration of broadband Internet access in Serbia is below the EU27 average (30%). Taking into consideration all relevant parameters, the Serbian

Internet market projected constant growth in the coming years. It is expected that the number of broadband connections per 100 citizens will reach the level present in the developed European countries by 2025.

According to the buyers IT investments analysis IT investments per capita in 2018 were €83 (1.4% of GDP per capita). The replacement cycle is far longer than in EU countries (instead of 3-4 years, ICT solutions are replaced after 6-7 years and even longer). The influence of the IT market on the economy, level of technical and technological preparedness of the economy and the society at large, with a special reference to the situation in the area of e-commerce and level of digital transformation of public and private enterprises in Serbia is very strong. Companies and institutions invest in IT departments and servers in their companies (table 4).

Table 4. IT investments according to buyer's sector & size in 2018

IT investments according to buyer's sector	Value (mill. €)	Participation (%)	IT investments according to buyer's size	No.	Participation (%)
Agriculture and mining	9,5	2,1%	Large systems (1.000+ employees)	132,6	29,3%
Manufacturing (processing)	68,0	15,0%	Large enterprises (250-999 employees)	54,8	12,1%
Energy, public and utility companies	42,1	9,3%	Medium enterprises (50-249 employees)	61,0	13,5%
Construction and construction material	10,4	2,3%	Small enterprises (10-49 employees)	57,9	12,8%
Trade and tourism	43,5	9,6%	Micro enterprises (<10 employees)	30,1	6,6%
Traffic and warehousing	14,4	3,2%	Public administration and state-financed organizations	116,3	25,7%
Communication (ICT), broadcasting and media	61,7	13,6%			
Finance and services	57,3	12,7%			
Business services	18,4	4,1%			
Public administration and state-financed activities	78,4	17,3%			
Education and culture	19,0	4,2%			
Health and welfare	18,8	4,2%			
Others	11,2	2,5%			
TOTAL	452,7	100%	TOTAL	452,7	100%

Source: According to SITO, 2019.

Therefore, in order to narrow the digital gap, Serbia needs an average annual growth rate of the IT market more than 10% until 2025.

The ICT related *innovations* (Statistical Office 2014) represent between 17% and 26% of the total innovative output in the EU. 2 700 innovative ICT companies are in Serbia. Based on the patent analysis, ICT-related patent

applications make approximately 15% of all domestic patent applications. Concerning patent applications, and R&D activities of the ICT sector more than 70% of companies had introduced an innovation in the last 7 years and 60% stated that they carry out their own research and development efforts (Serbia has latest rank is 44 out of 103 countries in 2016). On the other hand, cooperation within the R&D sector in the country is on a low level, as only one third of the companies reported that they collaborate in this manner. Since ICT is the most dynamic sector and presuming that innovative start-ups play important role here, support needs to be directed to this layer of the economy.

3.1.1. IT employment and education

In regard to employment, between 2016 and 2020 there were approximately 30 000 new jobs opened by IT start-ups in Serbia, primarily related to offering cloud solutions to SMEs and the public sector. The employment growth in group 62.0 Computer programming, consultancy and related activities (Eurostat 2019) can be illustrated with further data: 2010-5, 856; 2015-12, 993. In 2019- 2,349 IT companies from ICT sector had 28,543 employees (1.8% of total Serbian workforce). 13,077 people employ SMEs from Software sub-sector (67.2% of the total workforce of sub-sector). Average number of employees in Software SME segment is 34, more than 2.8 times bigger than IT industry average. Two thirds were IT experts, and the rest is made of sales, administration, and management personnel. However, other estimates show that this is just a part of a larger number of 60.000 IT experts, which includes employees in telecommunications, those working in non-IT companies, and the rest are self-employed individual IT entrepreneurs.

Employment in the software sector is growing above average; there are 19,414 employees - 68% of the IT sector workforce. Employment rose by 10%

compared to the previous year, but exclusively due to employment increase in export oriented IT companies. Revenue per employee in IT: €87,937 (ICT cluster Vojvodina 2020). Considering size of companies, medium IT companies employ the most - 33% of the total workforce, followed by small companies with 29%, while 11 big enterprises and some 1,830 micro enterprises employ nearly the same number - around 19%. Under such circumstances, it can be expected further growth up to 10.000 in coming three years.

A number of local IT services companies are staffed with highly skilled employees and the acquisition of these companies can be a useful tool for international vendor entry into one of the IT markets. Number of IT experts, those with small critical mass (up to 5 IT employees) and those with the necessary critical mass (over 5), show that 80% of companies employ up to 5 IT experts, and therefore do not have “critical mass”. In Serbia, more than half of the businesses (56%) which recruited or tried to recruit ICT specialists had difficulties to fill their vacancies, while the situation was worst among SMEs (61%), (while 33 % of large businesses recruited or tried to recruit specialists, the corresponding figure was just 7 % for SMEs),(Kutlaca, Zivkovic, Strbac, Semencenko & Popovic-Pantic 2018).

Decrease of employment can be expected only with hardware companies. Number of certified experts in the companies prevalently working with PC equipment is very small. These companies, for years now, cannot retain IT experts, losing their competitiveness, and will be increasingly less important in the IT industry (table 5).

Table 5. Workforce in software sub-sector according to the segments and company size, 2018

Software segment	Enterprises by size				Total
	Micro	Small	Medium	Large	
Software Exporter	182	178	59	7	426
ERP Specialist	76	67	4	0	147
Other Software	828	77	5	0	910
Total	1.086	322	68	7	1.483
Total (%9	73,2%	21,7%	4,6%	0,5%	100,0%

Source: Statistical Office of Republic of Serbia

Between 2016 and 2020 approximately 30 000 new jobs was opened by IT start-ups in Serbia, primarily related to offering cloud solutions to the public sector as well as to small and medium businesses. Based on the NACE Rev. 2 classification of economic activities, most of the companies are active in the field of computer programming, consultancy and related activities (more than 60%), followed by the companies active in data processing, hosting and related activities, web portals and software publishing. As the entrepreneurship system further develops through formal and informal education, more successful Serbian enterprises should be expected to appear in the future.

In terms of the current workforce, it is needed to increase the availability of scientists and engineers, and raise ICT/digital skills among the population. Considering the future of human capital - attracting and retaining talents should be in focus, together with the importance of on-the-job training. A revival in the development of human capital and the functioning of labor markets across Serbian economy requires focused efforts to renew training systems across various age and experience cohorts, with an emphasis on the ICT skills needed for emerging jobs. Apart from the ICT sector, also the finance, business administration, science & engineering, education, health

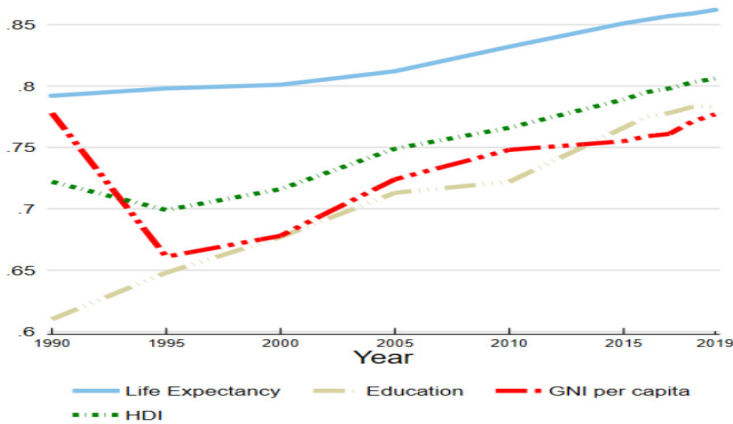
care, trade, and manufacturing have experienced rapid digital transformation (IDC for the European Commission 2014). Although, the nature of skills needed varies, digital skills are important for most managerial, professional, associate professional and even clerical jobs (Darrow 2015). While most medium to low skilled occupations (e.g., most elementary and factory jobs, subsistence farmers and construction workers) only require basic digital skills there are exceptions. Protective services workers, handicraft and printing workers, electro-engineering workers and sales workers require a higher digital skills level to do their job.

There is a strong base of programmers in Serbia, but capacities need to be further developed in specific areas, such as internet marketing. Around 84% of all current ICT employees hold a university degree and more than 80% of them work in the field of software development.

Through more than 40 Higher Education institutions the education and training system Serbia produces around 47,500 graduates annually – one third from business and administration universities, and a third from technical universities. Leading institutions in this field (i.e. Faculty of Electrical Engineering in Belgrade; Faculty of Mechanical Engineering in Belgrade; Technical University in Novi Sad; Faculty of Computing in Belgrade; Faculty of Organizational Sciences in Belgrade; Faculty of Mathematics in Belgrade; Faculty of Transport and Traffic Engineering in Belgrade), are internationally recognized for their expertise. Domestic universities have implemented substantial reforms in line with international standards to further enhance the quality of teaching provided.

Table 6. Serbia, Selected Indicators for education 2020

The Network Readiness Index, NRI 2020	Rank (134)	Score	Human Development index, HDI 2020	Indicator
Tertiary enrollment	36	48.86	Expected years of schooling	14.7 (years)
Adult literacy rate	21	98.54	Education index	0.783
ICT skills	74	48.56	Government expenditure on education	3.7 (% of GDP)
Technicians and associate professionals	42	48.63	Gross enrolment ratio, secondary	95 (% of secondary school-age population)
R&D expenditure by governments and higher education	32	51.00	Gross enrolment ratio, tertiary	67 (% of tertiary school-age pop.)
SDG Contribution in Quality Education	45	46.26	Internet users, total	73.4 (% of pop.)
Country capacity to attract and retain talent	98		Programme for International Student Assessment (PISA) score in mathematics	448
Critical thinking in teaching	68		Programme for (PISA) score in reading	439
On-the-job training	80		Programme for (PISA) score in science	440
			Employment to population ratio	47.9 (% ages 15 and older)
			Skilled labour force	82.9 (% of labour force)
Source: NRI-2020, WEF			Source: HDI 2020 (UNDP), Education,	

Figure 5. Trends in education indices 1990-2019

Source: HDI Index, Serbia, 1990-2019

The Global Information Technology Report (WEF 2016) puts quality of the Serbian educational system on quite low 110th position out of 139 ranked countries. However, in regard to the quality of math and science education, Serbia ranks 48th (World Economic Forum 2018). Thanks to the educational system being significantly focused on engineering and computer sciences, Serbia creates highly qualified and very capable young people with strong mathematical and logical background focus. IT professionals have extensive expertise in developing front-end, back-end and middle-ware components, and are also proficient in understanding client requirements and creating tailored software and systems solutions. There are evidences that faculties are constantly developing new IT programmes and their own capacities for new students. However, high growth of the ICT sector in Serbia, combined with the increased hiring by big global IT companies in Serbia, resulted in the lack of senior ICT experts. The competition for experienced employees is strong and affects the sector in a negative way. The salaries are considered not to be high in comparison to other regions in Europe, but are on a constant increase in average. Also, English language skills are considered to be

beneficial for the external market. The proficiency in English language for Serbian people has been on a high level for several years now. In this regard, Serbia is ranked 18rd globally and is among the countries having high proficiency level of English language (EF Education First 2018).

4. CONCLUSION

The research presented in the paper show that the ICT industry in Serbia is experiencing high growth in terms of employment, exports and profit and is becoming one of crucial drivers of the national economy. Based on the achievements of this sector, Serbia became a reputable regional player who even performs well on the global arena. The obvious need for collaboration is demonstrated by the human capital issues, as lack of experts with high experience in certain areas. Once the ICT firms move beyond customer-centered outsourcing they will face more common needs in the future such as needs for employing more senior developers and marketing staff. At that point, local networks should already be in place. With the support of the measures suggested here, the ICT industry in Serbia would have solidified base for further development within the country's economy, as well as, more importantly, at the international stage, effectively contributing to the competitiveness of the ICT sector of Europe.

The digital industries, the software industry first, needs to be better integrated into Serbia's economy and society. The strategic orientation to support the ICT sector cannot be successful if the industry is not diffused through all levels of the economy and society. In that process enhancing the R&D collaboration should positively affect this dimension and higher innovation efforts to arise in the ICT domain too, facilitating the bridging modern IT concerns, such as the digitalization.

In order to maintain this growth exercising greater spillover effect for facilitating development of bordering industries, increasing country's prospects for economic growth, the country needs to further improve the environment and ecosystem where it operates.

The education and training offer at Serbian universities is improving but the state needs to provide sufficient means to further support its improvement. Main improvements need to be done in the areas of increasing the educational opportunities for the digital competences and skills of students acquiring, increasing quotas for software engineering at universities, modernizing curricula, and advocating stronger entrepreneurial skills.

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INFORMACIONE TEHNOLOGIJE, OBRAZOVANJE I VEŠTINE ZA IZAZOVE U POSLOVIMA IT SEKTORA

Rezime:

Cilj istraživanja u ovom radu jeste da doprinese teorijskom i praktičnom merenju nedostatka IKT veština na domaćem tržištu radne snage. Srpska IKT industrija uzeta je kao studija slučaja. Glavni rezultati istraživanja upućuju na potrebu države da osigura da njen obrazovni sistem, postavke politike i poslovne prakse budu usmerene na osposobljavanje radnika potrebnim osnovnim i novim tehnološkim, digitalnim veštinama. Ovo će osigurati da srpska radna snaga bude u poziciji da odgovori budućim izazovima razvoja povezanim sa digitalnim uticajima. Na uobičajeni način pomoću različitih merenja i koncepata, iako su pouzdani i dosledni podaci često oskudni, naponi autora idu ka kvantitativnim indeksima ili kvalitativnoj proceni budućih potreba IKT veština na tržištu rada. Nalazi doprinose inovativnom pristupu utvrđivanja rizika nedostatka ili viškova veština

uz navođenje IKT zanimanja koja su prioriteta i sektorsku analizu razloga neusklađenosti i njihovog prevazilaženja.

Ključne reči: e-veštine, IKT nedostajuće veštine, Potrebni visokostručni kadrovi za IKT industriju

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