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KEY CHALLENGES FOR THE SERBIAN EDUCATION

Ključni izazovi pred sistemom obrazovanja u Srbiji

Abstract

The Fourth Industrial Revolution is causing an accelerated transformation of economies and societies globally. Ways of production, consumption, service delivery and communication are changing. Labor market demands are changing dramatically. New occupations emerge and existing ones disappear. This opens up new opportunities, raises productivity, enables higher consumption, encourages growth, yet to reap the benefits from the positive effects of change, significant investment in human capital and knowledge and skills development of the population is essential. Such rapid changes result in high uncertainty as to the skills needed for the future. It is already obvious that even at lower education levels, preparing individuals to cope with a complex, digital environment becomes important.

The emphasis in education is moving from memorization to developing analytical and critical thinking, problem solving, creativity, adaptability, team work, skills for lifelong learning. The education system needs to ensure people are equipped with the skills to adapt to technological changes to avoid the widening social gaps. The required knowledge and skills need to be developed before entering the labor market, and updated throughout the working life.

Analysis of the Serbian education system outcomes at different levels shows that it fails to fulfill its social task. Students' results in international testing are below average, graduates are inadequately prepared for their first job requirements, the profile structure from secondary school level upwards is notably mismatched to the labor market needs. What is required is a radical, consistent reform of the education system at all levels. Solutions exist, what we need is to acknowledge the world around us.

Keywords: *education, skills, labor market, Fourth Industrial Revolution, Serbia*

Sažetak

Četvrta industrijska revolucija dovodi do ubrzane transformacije ekonomija i društava na globalnom nivou. Menjaju se načini proizvodnje, potrošnje, pružanja usluga, komunikacija. Zahtevi tržišta rada se dramatično menjaju. Nastaju nova zanimanja i nestaju postojeća. Sve to otvara nove mogućnosti, podiže produktivnost rada, podstiče rast, ali da bi se iskoristili pozitivni efekti promena, neophodno je značajno investiranje u humani kapital, u razvoj znanja i veština populacije.

Imajući u vidu dinamiku promena, postoji visok stepen neizvesnosti o tome koja će sve znanja biti potrebna u budućnosti. Ali, danas je već jasno da će i na nižim nivoima obrazovanja biti potrebno razvijati znanja i veštine koje će osposobljavati pojedince da se snalaze u kompleksnom, digitalnom okruženju.

Akcenat se u obrazovanju pomera sa memorisanja na razvijanje analitičkog i kritičkog mišljenja, rešavanje problema, razvijanje kreativnosti, adaptibilnosti, timskog rada, razvijanje sposobnosti za celo životno učenje. Obrazovni sistem ima zadatak da osposobi članove društva da se mogu prilagoditi tehnološkim promenama, i izbeći sudbinu žrtve. Potrebna znanja i veštine neophodno je razviti kod učenika pre njihovog uključivanja na tržište rada i nastaviti sa usavršavanjem tokom radnog veka.

Analiza efekata rada obrazovnog sistema u Srbiji, po nivoima obrazovanja, pokazuje da on ne uspeva da ostvari svoj društveni zadatak. Naši učenici postižu ispodprosečne rezultate na međunarodnim ispitivanjima, diplomirani studenti nisu adekvatno pripremljeni za zahteve svog prvog radnog mesta, struktura i broj diplomaca od srednjoškolskog nivoa nadalje je u značajnom disbalansu sa potrebama tržišta rada. Očigledno je neophodno preduzeti korenitu, konsistentnu reformu sistema obrazovanja na svim nivoima. Rešenja postoje, potrebno je sagledati svet oko nas.

Ključne reči: *obrazovanje, veštine, tržište rada, Četvrta industrijska revolucija, Srbija*

Introduction

The world is profoundly changing. Precipitated by the impact of synergistic effects of the digital, physical and biological technologies' developments, the ways of production, consumption, and provision of communication services are being transformed. There is a growing degree of general mobility, from the movement of capital, over knowledge to people. The ways of what and how things are being done are changing, as well as the ways how we interact with one another, our cultural patterns and value systems. All these changes have created and are creating a wide specter of new opportunities in all areas of human activity.

The size, speed and scope of changes on the global scale are such that these times are called the times of the Fourth Industrial Revolution. Like any revolution, this one also causes breakdowns of the existing systems and demands adaptation. One of the first areas that have been affected is the labor market, with new jobs emerging and the existing ones disappearing. Imbalances emerge at short notice, with armies of the unemployed being created, on the one hand, the youth population being particularly vulnerable, whereas, on the other hand, companies cannot fill in their needs for people with certain competences and skills. These processes have far-reaching socio-economic effects.

Bearing in mind that one of the crucial missions of the education system is to prime the population for embarking on economic and social trends, a serious task is set before education systems worldwide, and the task is as follows: based on the anticipation of the trends of change in the forthcoming decades, with changes going ahead of predictions, to foresee the necessary knowledge and skills for the future, to devise and apply new methods and techniques of learning, pertinent to the times of explosive growth of online communications and education, globalization in education, increasing intercultural contacts and migration.

The education system in Serbia is facing the same task, yet our task is even more complex. Our education system is lagging behind in terms of requirements of the times. It is necessary that the system, which has been self-serving for decades, isolated from the environment, and under the strong influence of commercial goals, be opened and adapted to global flows. On several occasions, certain steps have been taken with the aim of raising the quality of education, yet they may be characterized as "remedies" rather than consistent reforms.

Furthermore, there are other problems as well, a seriously distorted system of values in a society that has been undergoing transition for almost three decades, negative demographic trends, outflow of young qualified personnel, poor economy, shaken credibility of the education system.

However, we have no choice. The solution to our economic problems lies in raising competitiveness, and competitiveness relies on the development of education, science and innovation. It is important to develop the awareness among economic policy makers that in the times of a knowledge-based economy, it is the education system that takes on the role of the key development factor, as it is the well-educated population that is a fundamental resource for both the use of existing resources and the development of new ones that will be based on the advancement of science and technology.

In seeking a solution, it is necessary to perceive the changes around us. Adaptation needs to be carried out consistently at all levels from pre-school education to doctoral studies.

The impact of new technologies on the global labor market trends

Powerful new technologies are reshaping our world, improving lives and increasing productivity, yet affecting our jobs as well.

In January 2017, McKinsey Global Institute published the results of a research that assesses the number and types of jobs that might be created under different scenarios through 2030, and compares that to the work that could be displaced by automation [8]. The analysis covers 46 countries comprising almost 90% of global GDP, with focus on six countries that span income levels (China, Germany, India, Japan, Mexico, and the United States). For each, they modeled potential net employment changes for more than 800 occupations,

based on different scenarios for the pace of automation adoption and for future labor demand. The intent of the research was to present a set of scenarios (as they say necessarily incomplete) to serve as a guide, as we anticipate and prepare for the future of work.

The results reveal a rich mosaic of potential shifts in occupations in the years ahead, with important implications for workforce skills and wages. The key finding is that while there may be enough work to maintain full employment to 2030 under most scenarios, the transitions will be very challenging — matching or even exceeding the scale of shifts out of agriculture and manufacturing we have seen in the past.

The survey states that:

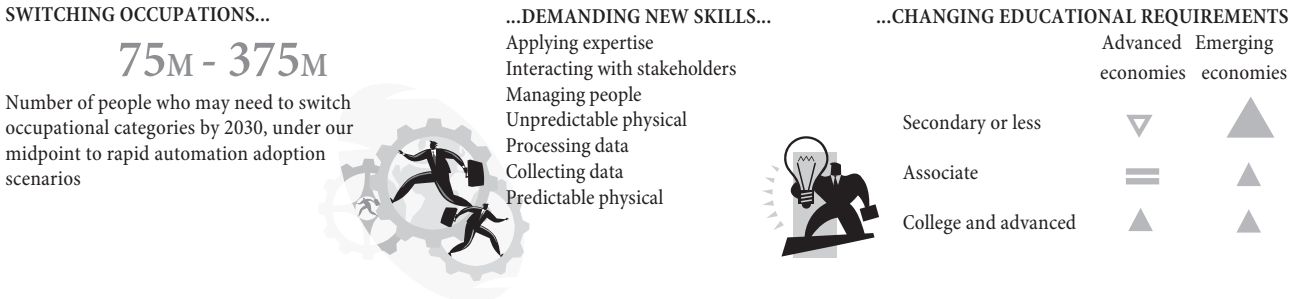
- 6 of 10 current occupations have more than 30% of activities that are technically automatable.
- About 50% of all work activities globally have the technical potential to be automated by adapting currently demonstrated technologies. The proportion of work actually displaced by 2030 will likely be lower because of technical, economic, and social factors that affect adoption.
- 75 million to 375 million workers globally (14% of the global workforce) will likely need to transition to new occupational categories and learn new skills, in the event of rapid automation adoption (Figure 1). Moreover, all workers will need to adapt, as their occupations evolve alongside increasingly capable machines. Some of that adaptation will require higher educational attainment, or spending more time on activities that require social and emotional skills, creativity, high-level cognitive capabilities and other skills relatively hard to automate.
- Scenarios across 46 countries suggest that between almost zero and one-third of work activities could be displaced by 2030, with a midpoint of 15%. The proportion varies widely across countries, with advanced economies more affected by automation than developing ones.
- The findings suggest that several trends that may serve as catalysts of future labor needs could create demand for millions of jobs by 2030. These trends include caring for others in aging societies, raising energy efficiency and meeting climate challenges, producing goods and services for the expanding consuming class, especially in developing countries, not to mention the investment in technology, infrastructure, and buildings needed in all countries (Figure 2).

It may be observed that these jobs gained could more than offset the jobs lost to automation. None of this will happen by itself — it will require businesses and governments to seize opportunities to boost job creation and for labor markets to function well.

On many dimensions, we may find similarities between the scope and effects of automation today compared with earlier waves of technology disruption, going back to the Industrial Revolution.

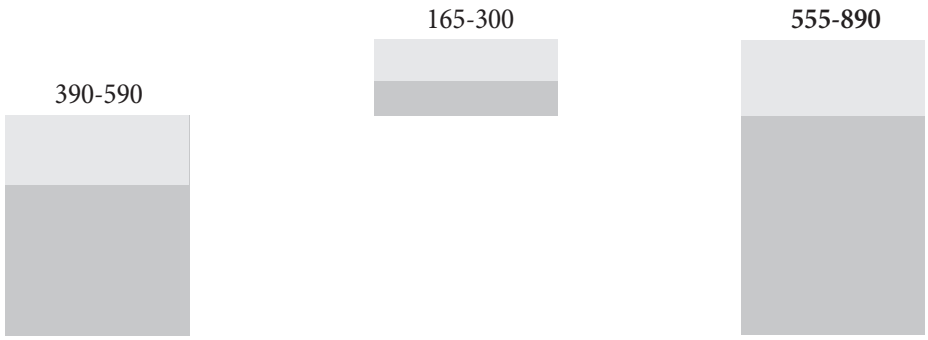
However, automation going forward might prove to be more disruptive than in recent decades — and on par with the most rapid changes in the past — in two ways. First, if technological advances continue apace and are adopted rapidly, the rate of worker displacement could be faster. Second, if many sectors adopt automation simultaneously, the percentage of the workforce affected by it could be higher.

Figure 1: Workforce transitions



Source: [8, p. 5].

Figure 2: Scenarios for labor demand from selected catalysts, 2016-30



Selected catalysts						
Rising incomes	Health care for aging populations	Investment in infrastructure	Investment in buildings	Investment in energy	Technology development	Market for previously unpaid work

Source: [8].

In the past, all advanced economies have experienced profound sectoral shifts in employment, first in agriculture and more recently in manufacturing, even as overall employment has grown. In the United States, the agricultural share of total employment declined from 60% in 1850 to less than 5% by 1970, while manufacturing fell from 26% of total US employment in 1960 to below 10% today. Other countries have experienced even faster declines: one-third of China's workforce moved out of agriculture between 1990 and 2015 [7]. Throughout these large shifts of workers across occupations and sectors, overall employment as a share of the population has continued to grow.

According to the estimates for Europe, between 2015 and 2025 opportunities will grow for highly-skilled people (+21%), while stagnating for medium-skill levels and declining for the low skilled (-17%). Depending on the country and occupation, 25-45% of jobs will be subject to automation. This is why upskilling and reskilling are indispensable [3].

History tells us that in the long run, technology is a net creator of jobs. New industries and occupations have emerged to absorb workers displaced by technology[1]. In their article *Five lessons from history on AI, automation, and employment* [7], Susan Lund and James Manyika outlined the following conclusions: Employment in some sectors can decline sharply, but jobs created elsewhere have absorbed those that have been displaced; Employment shifts can be painful; Technology creates more jobs than it destroys, including some you can't imagine at the outset; Technology raises productivity growth, which in turn boosts demand and creates jobs; Thanks to technology we all work less and play more.

Most jobs created by technology are outside the technology-producing sector itself. There are estimates that the introduction of the personal computer, for instance, has enabled the creation of 15.8 million net new jobs in the United States since 1980, even after accounting for jobs displaced. About 90 percent of these are in occupations that use the PC in other industries, such as call-centre representatives, financial analysts, and inventory managers.

New technologies have raised productivity growth. Rising productivity is usually accompanied by employment growth: it raises incomes, which are then spent, creating demand for goods and services across the economy. This stimulates demand across the economy, boosting job creation.

Furthermore, over the long term, productivity growth enabled by technology has reduced the average hours worked per week and allowed people to enjoy more leisure time. Across advanced economies, the length of the average workweek has fallen by nearly 50% since the early 1900s, reflecting shorter working hours, more paid days off for personal time and vacations, and the recent rise of part-time work [7], [9]. This

1 In the United States, 0.56 % of new jobs created each year are in new occupations [7].

growth in leisure has led to the creation of new industries, from golf to video games to home improvement.

We may conclude that technological changes will cause significant changes in the labor market, with millions of jobs lost and millions of new ones gained. In the long run, employment will increase. These changes will challenge current educational and workforce training models, as well as business approaches to skill-building.

At the end of 2017, The McKinsey Global Institute launched a survey with the aim of assessing attitudes about the need for retraining and reskilling workers in the age of automation [6]. The survey polled more than 1,500 respondents from businesses, the public sector, and not for profits across regions, industries and sectors. At the beginning of 2018, they published response results from roughly 300 executives at companies with more than $100 million in annual revenues. To the question "How important is addressing potential gaps related to automation and/or digitization within your organization's workforce?", 62% of executives replied that they believed they would need to retrain or replace more than a quarter of their workforce between now and 2023 due to advancing automation and digitization. Over 70% of executives in Europe and 64% in the United States put that issue in the top 10 priorities [6, p. 3].

The question "How can your organization best resolve its potential skills gaps related to automation and/or digitization over the next five years?" yielded the following answers. In terms of solutions, 82% of executives at companies with more than $100 million in annual revenues believe that retraining and reskilling must be at least half of the answer to addressing their skills gap. Within that consensus, though, there were clear regional differences. Fully 94% of those surveyed in Europe insisted that the answer would either be an equal mix of hiring and retraining or mainly retraining versus a strong but less resounding 62% in this camp in the United States. By contrast, 35% of Americans thought the challenge would have to be met mainly or exclusively by hiring new talent, compared to just 7% in this camp in Europe.

It is interesting to note that to the question "Which of the following groups or institutions (governments, individual workers, corporations, higher education institutions, primary and secondary schools, other) should take the lead in addressing any potential skills gaps related to automation and /or digitization over the next five years?", 64% of executives in the United States and 59% in Europe replied that it should be the corporations that should take the lead.

About one-third of executives feel an urgent need to rethink and upgrade their current HR infrastructure. Many companies are also struggling to figure out how job roles will change and what kind of talent they will require over the next five to ten years. Some executives who saw this as a top priority — 42% in the United States, 24% in Europe, and 31% in the rest of the world — admit they currently lack a "good understanding of how automation and/or digitization will affect our future skills needs."

Such a high degree of anxiety is understandable. In our experience, too much traditional training and retraining goes off the rails, because it delivers no clear pathway to new work, relies too heavily on theory versus practice, and fails to show a return on investment (ROI).

Workers of the future will spend more time on activities that machines are less capable of, such as managing people, applying expertise, and communicating with others. They will spend less time on predictable physical activities and on collecting and processing data, where machines already exceed human performance. The skills and capabilities required will also shift, requiring more social and emotional skills and more advanced cognitive capabilities, such as logical reasoning and creativity [6], [9].

The education system in Serbia

An overview of the trends dominating the global labor market is a good indicator of the dynamics underlying the creation of new professions and the loss of the existing ones. This process puts serious demands before the education system. The currently prevailing models that offer profiled "knowledge sets" for specific professions will not be able to respond to the demands of the times. Having in mind that, according to the estimates, current students will have to make several occupational shifts by the end of their working career in order to adapt to the labor market demands [8], that there are no longer clear boundaries between professions, and that the dynamics

of technological development progressively create new occupations[2], it is evident that changes are necessary in the very concept of education.

The question arises as to how good our education system is and how ready it is for it.

The education system encompasses all levels of education, from pre-school education and care, through primary, secondary, academic and professional studies, to masters and doctorates. It also incorporates adult education as well as teacher training.

Pre-school education

Numerous studies (UNESCO, UNICEF, OSCE) suggest that investing in early education and care provides the foundation for an overall whole-person development, ensures more successful participation in the following stages of education, and leads to significant cost savings in later education, as well. It is estimated that the rates of return on investments are greatest at the pre-school level[3]. Pre-school age is considered to be from 0.5 to 6 years old.

Intensive efforts are being made in terms of development of pre-school education in Serbia. At present, there are 334 institutions (162 state and 172 private) [11] operating in the field of pre-school education in Serbia. The number has doubled compared to 2010 [13, p. 16]; however, it still cannot meet the real needs[4] of the population, and unfortunately it is least accessible to children from rural areas and families from socially and economically vulnerable categories.

The goal in this area should be to achieve the full coverage of children in pre-school education. According to the data from 2015, approximately 66% of children in Serbia under the age of 5 were covered by pre-school education, whereas European Union has a coverage of 85% [16]. When the coverage is observed by age groups, it can be seen that in five-year-olds it is 51%, in three-year-olds about 46%, and in the younger age groups even lower. The best results have been achieved in the pre-school preparatory program that is compulsory and free and is intended for children one year prior to their entering primary school. The average coverage of children in this program in 2017 was 97% (the highest percentage in Vojvodina at 99%, and the lowest in the Belgrade region at 93%) [11].

It is evident that the state is making significant endeavors in the development of pre-school education through: participation in costs (it formally covers 80% of costs, yet realistically this percentage is estimated to be 33% [16], through legal regulation in enabling priority status for the enrolment of children from vulnerable social groups, and a number of other measures at the national and local levels. However, the coverage is still not at a satisfactory level, and a particular problem is, in fact, the deep inequity of the system since the least represented are the children from marginal social groups where early incentives are indeed most needed. Indicators say that the largest coverage is represented in children from educated families with a higher socio-economic status. Bearing in mind how limited the resources are, with only 0.43% of GDP being allocated for pre-school education, a question may be raised as to the justification of the linear coverage of costs as a social measure at this level of education.

Primary and secondary education

If we take a look at the primary education in Serbia, according to The Global Competitiveness Reports (GCR) from 2011 to 2018[5], based on the Quality of primary education indicator, we may observe that our rankings ranged from the lowest 83rd place (out of 144 countries) in 2012, up to the 64th place (out of 137 countries) in 2018 (Table 1).

The score is defined upon the Executive Opinion Survey, where respondents provide an answer to the question: "In your country, how do you assess the quality of primary education?", rating it on a scale from 1 to 7, where 1 represents the lowest grade, meaning extremely poor - among the worst in the world, and 7 the highest one, meaning excellent - among the best in the world.

2 At the World Economic Forum in Davos in 2017, it was stated that three out of five six-year-olds today cannot even envisage what they will be doing in the future.

3 Unfortunately, there have not been any evaluational studies in our country that would show the positive effects of pre-school education on a better start in primary school, higher rate of social inclusion, higher rate of women employment, poverty reduction, etc.

4 This year, 4,500 children have remained on waiting lists. Most of them in the south of Serbia, over 3,000.

5 There are no complete data for Serbia for the previous years.

Table 1: Primary education - ranking

Indicator	Year	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
4.09: Quality of primary education	Score	3.7	3.5	3.7	3.8	3.7	3.7	4.1
	Rank	74	83	81	78	81	81	64
4.10: Primary education enrollment rate, net %	Score	94.20%	92.70%	93.20%	91.40%	94.80%	94.80%	96.30%
	Rank	58	77	82	94	66	66	60

Source: [24], [23], [22], [21], [20], [19], [18].

According to another, far more exact indicator, Primary education enrollment rate, net%, in terms of rankings, Serbia ranged from the 94th place in 2014-2015, with the enrolment rate of 91.4% to the 60th position in 2017, with the enrolment rate of 96.3%.

The goal set by the Strategy for the Development of Education in Serbia by 2020 [13] is to achieve the enrollment rate in primary education of at least 98%, with the dropout rate not exceeding 5%. In order to achieve this goal, it is necessary to increase the coverage of children from rural areas. In the past ten years, their coverage was about 80%, with a negative trend and a significantly higher dropout rate compared to urban areas [13, p. 30]. The most vulnerable are Roma children. There are no precise data on their number, but according to estimates, their coverage is about 75%. The total dropout rate of students in primary education is determined based on the number of children who do not enroll in primary school, who do not pass to the fifth grade and who do not complete primary school. According to existing analyses and estimates, dropout ranges between 10-15% in a generation, with the percentage being significantly higher in children from vulnerable groups. The European documents emphasize that the dropout rate for children during primary education should be below 10%.

In addition to the quantitative data, the question of the quality of education is subject to debate as well.

In international assessment studies, the achievements of our students indicate that the quality of our education is below the international average[6].

According to the results of the PISA test, which determines the applicability of the acquired knowledge and skills, if we imagined two identical children, one being educated in Serbia, and the other in the OECD countries, the difference in their achievements in the field of mathematical, reading and scientific literacy would be between 50 and 60 points, in favor of the OECD countries. This difference corresponds to the effect of 1.5 years of schooling [1, p. 113]. When compared to Finland, which is a champion in this field, the difference would be equivalent to the effect of 2-2.5 years of schooling [1, p. 115].

The analysis of the achievements of our students in terms of the attained levels[7] in all the three domains shows that two-thirds of students are placed in the two lowest levels. The testing has shown that in Serbia, one-third of students (33%) are reading-illiterate, meaning that every third student in the Republic of Serbia has difficulties in reading and understanding more complex texts; this certainly poses a significant obstacle to their further education. If we add about 10% of the children outside the education system, we get a result of almost 50% of children who are functionally illiterate in terms of reading literacy. In the domain of mathematical literacy, 40% are functionally illiterate, and in the domain of scientific literacy, the result is 34%[8]. In other countries covered by this testing, these percentages range from 10% to 20%, whereas in Finland it is only 6-8%.

It is extremely important to acknowledge the consequences of the fact that 40-50% of students in Serbia are functionally illiterate. The consequences are reflected both on the individual and on the social level.

6 The exception are the results of the TIMSS study (Trends in International Mathematics and Science Study) in 2017, which included 57 countries from around the world, where fourth-grade primary school students were tested. Our primary school students showed results above the average. They scored 518 points in mathematics (the average being 500), Finland and Poland had 535, and the best was Singapore with 618 points. As for natural sciences, 525 points were scored (the ranking of Denmark, Germany, and Canada).

7 Achievements are ranked in six levels.

8 It is interesting to compare these data with the fact that the grade point average in primary school is over 4. According to the data, 3/4 of the students have achieved excellent or very good school results at the end of the primary school education. This speaks enough about the prevailing assessment criteria.

On an individual level, the opportunities for inclusion of these young people in the labor market are very limited. They can only apply for jobs that require lower skills, and such jobs are increasingly in decline. Young people who are functionally illiterate today can only expect further difficulties in the future. They can hardly be included in the lifelong learning system and thus get a second chance. Society-wise, the negative consequences are reflected in an increase of unemployment, an increase in the costs of social programs, an increase in the costs for additional coaching and training, and a decline in the interest of foreign investors as a result of an insufficient availability of skilled workers or the necessary additional costs of training workers.

The fact that "nine years of education for this third of students has not provided sufficient motivation suggests that it is unlikely that, with two or three years of additional education of the same type, they will succeed in developing competencies to the extent necessary for continuing education, employability and lifelong education" [1, p. 95].

Furthermore, another negative aspect is evidenced in the fact that a very small number of students in Serbia is to be found in the highest achievement levels (in the two highest levels, it is very low, below 1% in the domain of reading, about 1% in science and 3% in mathematics). For example, only 10 out of 1,000 students in Serbia were ranked in the two highest levels of scientific literacy in the 2009 PISA testing, whereas there were 26 students in Bulgaria, 76 in Poland, 99 in Slovenia, and 187 in Finland. It is important to emphasize that it is from this very segment of students that the future bearers of innovative developments in the economy and society are recruited [1, p. 94].

The question arises as to why our results are so poor. The reasons may be sought in the curricula and the dominant teaching styles. The curricula place emphasis on academic knowledge, thus giving the impression of quality, yet neglecting the aspects of its practical application. Another important factor is certainly the poor financial status of our education which has a detrimental effect on the working conditions, the professional development of teachers who are coming close to becoming members of an existentially endangered social group, which certainly has ramifications on their motivation. It is important to add that, due to the poor financial position of employees in education at all levels, the best graduates choose other careers. This leads to the downgrading of the education workforce in the long run. The success of the Finnish education model can, inter alia, be attributed to the strict selection process for candidates who can work in education, which is passed only by the best, thus ensuring a distinguished social reputation for this profession, though not one accompanied by high earnings.

Higher education

According to the GCR assessment for the period from 2011 to 2018[9], the rankings of the higher education (HE) in Serbia ranged from the lowest 85th place in 2012 to a solid 59th position in 2017 (Table 2). A more in-depth analysis of these rankings shows that our coming closer to the middle of the list of the countries analyzed was mostly contributed by the subindicators: Quality of math and science education, Secondary education enrollment rate gross % and Tertiary education enrollment rate gross %.

It is a matter of concern that according to the subindicator Quality of the education system, our average position in the observed period was at the 110th place, with modest progress being recorded in the past two years. The score in this field is defined upon the Executive Opinion Survey based on the response to the question: "How well does the education system meet the needs of a competitive economy?" (1 = not well at all; 7 = extremely well). The score value, being about 3.3 points on an average, indicates that graduates do not leave universities and colleges adequately qualified to respond to the demands of their first job.

Such an assessment is confirmed by the research study carried out in 2016 by the European Commission in Serbia and the SEE countries [14]. This study explored the position of the higher education institutions' graduates in the labor market. On a 1-10 point scale, the employers surveyed assessed their satisfaction with the skills of the new graduates with a mean score of 5.9 (foreign employers' score being 7.0, and domestic 5.5). The opinion that HE graduates only bring "some" added-value compared to

9 The data for Serbia for the previous years are incomplete.

Table 2: Higher education and training – ranking

Indicator	Year	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
5th pillar: Higher education and training	Score	4	4	4	4.3	4.3	4.4	4.6
	Rank	81	85	83	74	71	69	59
5.01: Secondary educational enrollment rate gross %	Score	91.5	91.4	91.5	91.7	94.4	94.3	96.7
	Rank	57	58	62	66	58	64	58
5.02: Tertiary education enrollment rate gross %	Score	49.8	49.1	50.04	52.4	56.4	58.1	58.3
	Rank	50	52	50	52	45	46	45
5.03: Quality of education system	Score	3.1	3.1	3.1	3.1	3.1	3.2	3.3
	Rank	111	111	111	106	110	103	93
5.04: Quality of math and science education	Score	4.2	4.1	4.3	4.3	4.4	4.6	4.8
	Rank	58	60	55	53	48	46	29
5.05: Quality of management schools	Score	3.5	3.5	3.6	3.6	3.4	3.7	4
	Rank	114	116	114	114	116	105	85
5.06: Internet access in schools	Score	3.8	3.6	3.9	4.2	3.9	3.6	3.9
	Rank	83	125	121	106	107	102	85
5.07: Local availability of specialized training services	Score	3.2	3.2	3.4	3.5	3.6	3.9	4.1
	Rank	113	125	121	106	107	102	87
5.08: Extent of staff training	Score	2.9	2.9	3	3.1	3	3.2	3.4
	Rank	132	138	140	134	135	127	113

Source: [24], [23], [22], [21], [20], [19], [18].

non-graduates is held by 55% of employers. It is noticeable that employers in hi-tech sectors were less satisfied with the skills of new graduates compared to others.

It has been observed that 82% of employers organize additional training for their new employees, with as many as 92% of employers in high technology fields achieving this through formal training[10].

Rapid economic changes in the period of transition and global trends have led to new demands for skills. Higher education institutions have not adapted fast enough, so employers perceive graduates as having skill gaps. Figure 3 shows these skill gaps measured by the difference between skills that graduates need, and skills that graduates possess, on a range of skill dimensions (employer survey). Employers think that graduates lack interactive skills (e.g. adaptability, analytical and problem-solving skills, team working,) more than cognitive skills (e.g. reading, writing, numeracy). It is obvious that, although in varying degrees, there is a gap in almost all the skills, and what is yet more alarming is that the estimates predict that this gap, with the present state of HE, will grow even more in the forthcoming period (Figure 3).

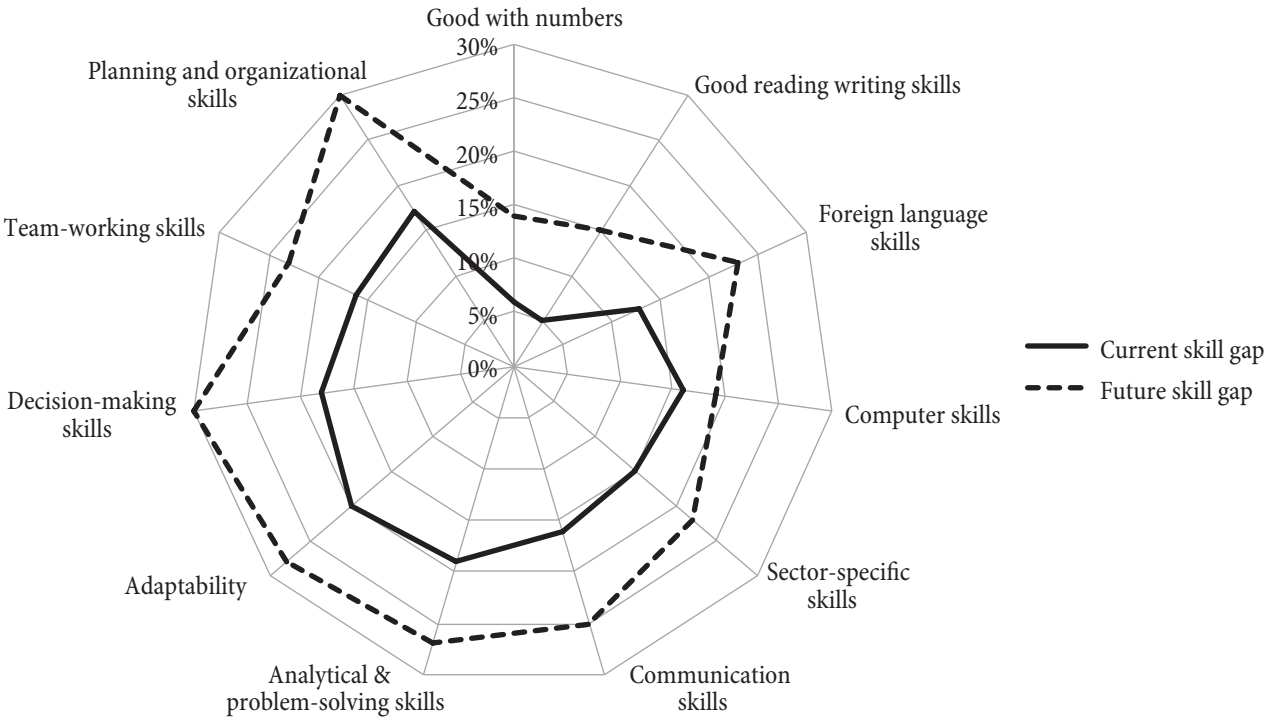
One of the reasons for the existence of such gaps certainly lies in the lack of cooperation between the higher education institutions and the economy. In most countries of the European Union, cooperation among employers and higher education institutions is commonplace. The study has shown that in Serbia, 47% of employers have never cooperated over curricula design with higher education institutions, 36% have rarely done it, and only 17% often. Yet, 71% say that such cooperation would be desirable and would improve the matching of graduates to the needs of the employer. It is obvious that there are many ways as well as a lot of reasons to improve the situation in our higher education.

This study has shown that, where Serbia is concerned, there are significant discrepancies between the workplace requirements and the types and levels of graduates' education in their first jobs. Almost a third of the employed graduates do not have the type of education in line with their job requirements, and 54% have an inadequate level of education (39% have higher qualifications than job requirements, 15% lower).

These data are not surprising. The output of graduates churned out from HEIs is not harmonized with the needs of the labor market neither by structure nor by number. This leads to an excess supply of certain profiles and high unemployment rates. In the given circumstances, even a job mismatched with the educational level or profile is a solution. The enrollment policy at HEIs does not follow

10 According to unofficial data, our companies have spent 3.5 billion Euros for additional training for their employees in the last ten years.

Figure 3: Graduate skill gaps – current and future



Source: [14, p. 41].

the trends of socio-economic development; on the one hand, as a result of inertia, it follows the principle of maintaining the existing capacities, and on the other hand, it is led by commercial interests. For years, the majority of students have enrolled at faculties that provide qualifications for occupations with the highest numbers of registered unemployed at the National Employment Service (NES). For example, for the school year 2015-16, there were 39,741 students enrolled at the faculties in the field of social sciences and humanities, out of which 13,419 were budget students, accounting for 47.9% of the total number of budget-financed students. At the same time, there were 42,274 persons with higher education qualifications for these profiles on the records of the National Employment Service (66.3% of the total number registered at the NES). The detrimental effects of such a policy are manifold.

These data point to the extent to which the functional link between the education system and the economy has been lost. Another additionally confusing fact is the inertia shown by the appropriate institutions in solving the problem. Limited resources of a poor economy are being spent ineffectively, thousands of highly educated unemployed are being churned out, thus creating new social problems and costs, while the country is losing competitiveness.

The Global Competitiveness Report 2016-17 introduced an updated GCI framework. One of the four major subindexes being observed is Human Capital, which measures how the health and skills of the labor force contribute to a country's competitiveness [18, pp. 51-62]. The education and skills pillar measures both the quantity and quality of skills and the training that today's workers possess, as well as the level of education and skills of tomorrow's workforce, with particular emphasis on the use of ICTs in school and the style of teaching. Measuring the skills of the current and future workforce together captures the dynamics of the workforce's skill set in each country, tracking whether the level of human capital is increasing or declining [18, p. 57].

According to the preliminary rankings performed in accordance with the new methodology, Serbia was ranked 53rd by Skills of the current workforce (with 135 countries being observed), and according to the estimates of the Skills of the future workforce, it held the 70th position [18, pp. 58-59]. In terms of the dynamics of our workforce development, it has been estimated that our future potential in this field will decrease by more than 10% (Table 3).

In comparison to the countries of the former Yugoslav republics, whose education systems have the same roots as ours, we can see that we are currently better positioned only compared to Bosnia and Herzegovina and Macedonia, and according to the development forecasts, it is expected that Bosnia and Herzegovina will achieve better ranks in the future. In the given group, we are the only ones where a significant further decline in the quality of workforce is expected.

It might be interesting to look at the estimates of changes in the currently top ranking countries (Table 4).

Denmark has the most sustainable system, with the skills of the current and future workforce both ranking in the top five. Denmark is one of the first countries to include computer science in its primary-school curriculum, together with the United Kingdom, Israel, New Zealand, and Australia. Finland and Iceland are among the advanced countries where the future workforce is expected to be better equipped than current workers, whereas Switzerland, Israel, and Japan are among those that may see their currently high level of human capital diminish going forward.

In the era of the Fourth Industrial Revolution, the education system takes over the role of the principal development factor. Bearing in mind the extent to which our education system does not fulfill its task of providing high-quality, efficient, and timely education of the population consistent with the development of knowledge and global trends, the question of our future might be rightly raised.

Conclusion

The hallmarks of this new industrial age are the accelerated pace of economic, societal and environmental transformations as well as technological breakthroughs in areas like robotics, Internet of Things, artificial intelligence, energy systems and bio-economy. Automation, enabled by information technologies, is transforming traditional manufacturing

Table 3: Estimation of the current and future workforce skills

Economy	5th pillar: Education and skills		A. Skills of the current workforce		B. Skills of the future workforce		Dynamics*
	Rank	Value	Rank	Value	Rank	Value	
Serbia	**58**	**4.33**	**53**	**4.57**	**70**	**4.09**	▼
Slovenia	19	5.49	20	5.38	17	5.59	
Montenegro	48	4.61	45	4.7	51	4.51	
Croatia	53	5.54	48	4.63	55	4.45	
Bosnia and Herzegovina	75	3.97	85	3.56	58	4.39	▲

Source: [18].

*The dynamics column shows the change vis-a-vis the current pillar of the Global Competitiveness Index.▲= The score of the Skills of the future workforce subpillar is higher than the score of the Skills of the current workforce by 15% or more. ▼ = The score of the Skills of the future workforce subpillar is lower than the score of the Skills of the current workforce by 10% or more.

Table 4: Top eleven ranking countries: Education and skills pillar

Economy	5th pillar: Education and skills		A. Skills of the current workforce		B. Skills of the future workforce		Dynamics
	Rank	Value	Rank	Value	Rank	Value	
Denmark	1	6.18	3	6.13	5	6.22	
Switzerland	2	6.17	1	6.56	12	5.79	▼
Norway	3	6.12	4	6.13	9	6.12	
Netherlands	4	6.11	9	5.92	2	6.29	
Sweden	4	6.09	6	5.97	6	6.22	
Australia	6	6.04	10	5.89	7	6.18	
United Kingdom	7	6.00	8	5.93	10	6.07	
Germany	8	5.93	2	6.20	15	5.67	
New Zealand	9	5.92	17	5.57	4	6.27	
Belgium	10	5.89	13	5.63	8	6.15	
Finland	11	5.88	23	5.33	1	6.43	▲

Source: [18].

processes and the nature of work. Emerging business models disrupt traditional markets [3, p. 2].

The industrial transformation provides enormous opportunities, but reaping them will require substantial investment in people's skills and talents, as well as intangible assets like research and innovation.

To cope with the significant pressure the ongoing industrial transformation is putting on industry and its workforce to adapt, particular attention needs to be given to build resilience and help people and communities to seize the opportunities of change. Education and training systems need to ensure that people are equipped with the right set of skills to drive such change and avoid widening social gaps. These skills need to be developed well before entering the labor market and updated throughout the working life [4].

At every level of schooling, the education system needs to teach competences that are relevant to the modern economy. Even lower-skilled jobs increasingly require talent and knowledge, so vocational training and secondary education need to equip people with the ability to work in a complex, digital environment. "Because change occurs so quickly, there is a high level of uncertainty regarding the skills needed for the future. However, at all skill levels, individuals will be rewarded for the capacity to think critically, solve problems, and take advantage of new technologies. Schools will therefore need to teach flexible thinking rather than emphasizing memorization; they will need to show students how to cooperate and work with individuals with different backgrounds as well as to compete, and will need to nurture the ability to challenge, confront, and critically appraise differing ideas"[18, p. 57].

Even the most advanced countries today could quickly lose their human capital advantage if their education systems fail to increase the quantity and quality of skills of their future professionals and entrepreneurs. Similarly, developing countries could see their investments in education generate decreasing returns if they do not manage to update curricula and teaching styles [17].

In this light, it was important to take a close look at our education system to get a clear picture of what it is like and how much we are working on its development.

The analysis of the effects of the education system in Serbia, by levels of schooling, has shown that it fails to fulfill its social task. Our students achieve below-average results in international testing, graduates are not adequately prepared for the requirements of their first job, the structure of the educational profiles starting from secondary school level upwards is notably mismatched to the needs of the labor market, lifelong learning has not been developed to a satisfactory degree. Such results may be interpreted as outcomes of an academic approach espoused in curricula design as well as obsolete teaching methods. The curricula do not correspond to the requirements of the times.

There were several attempts made at reforming certain levels and segments of education in the past, but they could be thought of more as "remedies", rather than comprehensive and meaningful changes throughout the entire education system.

When it comes to education in this country, the problem most often stated as principal is the low investment in education. State investments are indeed low[11], which has an effect on quality, but our problem is much more serious and cannot be solved by merely increasing investments.

We may say that the position of the education system in Serbia is anachronistic. The education system has been set up as if it were an end in itself, instead of being a pillar for the development of the entire society. In the times of intensive growth and exchange of new knowledge at the global level, and the development of a knowledge-based economy, the collaboration of our education system with other segments of the society is inexcusably low. The curricula and syllabi should evolve as a result of the interaction among the education system, the industry, the public sector, and other segments of the society. In the analysis of the state of education in the Strategy for the Development of Education by 2020, it has been stated that "the system of education is self-serving, isolated from the environment, highly shaped by commercial interests, exposed to political parties' influences, characterized by short-lived amendments whose main purpose was to satisfy all the interested parties, without taking into consideration the long-term consequences of such an

11 State investment is only a part of investment in education. Significant investments are made by parents and the industry.

approach to solving the problem. The emergence of private educational institutions, publicly advocated as a contribution to improving the quality of education by strengthening the competition mechanism, has in the majority of cases mainly been inspired and guided by profit interests and marked by an absence of public or any other requirements in terms of the quality of education. A sharp antinomy has unfolded in the education system between short-term economic interests on the one hand and the education missions aimed at development, on the other. The tensions arising from this polarity are one of the biggest obstacles to the further well-founded development of education" [13, p. 2].

There is an urgent need for expanding the reach, accessibility, affordability and quality education at all levels. But multiplying the existing model is not sufficient. Indeed, it is likely to aggravate rather than alleviate many problems due to the time warp and gap between education offered today and that which is so urgently needed. We not only need more education, but education that is qualitatively different – a new paradigm. Updating course content is not enough. We need an education that equips youth to adapt to future innovations and challenges that cannot be anticipated now. Many other countries are facing the same challenge.

The steps to be taken and the things to be done have been well defined in the Strategy for the Development of Education by 2020. Unfortunately, since its adoption to this very day, there have scarcely been any serious attempts towards its implementation. However, although more than five years have elapsed since its publication, it has not lost its actuality and it may serve as a sound guideline. We are hoping for a social consensus to be reached for the transformation of the education system in Serbia, empowering it to take on its rightful place and role.

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