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CHALLENGES OF THE FOURTH INDUSTRIAL REVOLUTION: A CASE STUDY OF BOSNIA AND HERZEGOVINA

Abstract

This study focuses on Industry 4.0 in developing countries and, in particular, that of Bosnia and Herzegovina, which is one of the least competitive economies in the Region. A review of the literature on Industry 4.0 and the current prospect of it in the developing countries will be presented and then collecting the required data from the secondary data. This study aims to explore the main challenges along with some opportunities to apply Industry 4.0 in Bosnia and Herzegovina. The challenges that will be tested include poor infrastructure, harmonization of the education system and labour market, expensive installation of technologies, lack of government supports and growing trend of depopulation. Through insight into the structure of world trade and technology achievement, we will also look at the fact that the new industrial revolution will bring an even greater gap between developed and developing countries and try to answer the question of why such a disproportion in development occurs. As this is one of the first research projects regarding Industry 4.0 in Bosnia and Herzegovina, the findings of the study will generate some recommendations and propose some alternatives to be considered that could be useful for the decision-makers both in government and the private sector.

Keywords: Industry 4.0, developing countries, challenges, disproportion

1. INTRODUCTION AND BACKGROUND

The industrial sector is important to every country's economy and remains the driver of growth and employment. More attention is devoted to the implications of the integration of new technological products and services and the creation of industrial values. New technologies evolve at an exponential rate and there is no historical precedent that marked the beginning of evolution. These moves are followed by the emergence of artificial intelligence, robotics, the Internet of things, autonomous vehicles, both nanotechnology, 3-D printing, material science, quantum computing and storage energy (Hussin, 2018). This new paradigm of digitized and related products is called "Industry 4.0". The term "Industry 4.0" became publicly known in 2011, when an initiative called "Industry 4.0" where an association of representatives from business, politics, and academia promote the idea as an approach to strengthen the competitiveness of German manufacturing industry (Hermann, Pentek i Otto, 2015). The idea of Industry 4.0 includes a wide variety of devices,

from smartphones, gadgets, televisions and watches to household appliances, which are becoming ever more flexible and intelligent (KUKA, 2016). Industry 4.0 or fourth industrial revolution also refers to the next phase in a digitization of the manufacturing sector where the Internet of Things (IoT) looks to play a huge role that have the potential to feed information into it and add value to manufacturing industry to realize a low-volume, highmix production in a cost-efficient way (Willliam, 2014). Industry 4.0 is also called the fourth industrial revolution, based on the "Internet of products and service" after mechanization (Industry 1.0), mass production (Industry 2.0) and automation (Industry 3.0). Internet of products and services is already an inevitable part of production in developed countries, particularly in sophisticated manufacturing and service industries, such as car manufacturing, aircraft manufacturing, insurance, logistics and communications industries (Witkowski, 2017)

Today's employees will work in a more globalized, automated, virtualized, networked, and more flexible world. They will compete for business on the global market. In this way, new competencies and skills become more important. The adoption of industry 4.0 will enable producers to create new jobs to meet the needs that have led to the growth of existing markets and the introduction of new products and services (Motyl et al., 2017). Experts predict that companies will be able to increase their productivity by about 30% using industry 4.0 (BDI, 2016). However, there is also a question of how to measure the country's readiness for the 4.0 industrial revolution. For this paper, some of the company or state-level indicators will be presented which can be used to assess readiness or achieve industrial and competitive development. Also, some of the above indicators have been used in this work to assess the impact of ICT sector development. So, according to Roland Berger (2014) Industry 4.0 Readiness index includes the following sets of indicators when creates country rankings:

1. Industrial excellence: a. production process sophistication b. degree of automation c. workforce readiness d. innovation intensity
2. Value network: e. high value-added f. industry openness g. innovation network h. internet sophistication.

Also, The Doing Business index is focusing on the environment Small and Medium Size Enterprises are operating in. The data collected are relating to the largest business city of each economy and covering 10 areas: starting a business; dealing with construction permits; getting electricity; registering property; getting credit; protecting investors; paying taxes; trading across borders; enforcing contracts; resolving insolvency. One of the most popular analysis frameworks for global competitiveness is Michael Porter's (2008) Diamond Model. Porter identifies four factors with the high impact of national and regional competitiveness.

These are:

1. Factor conditions that can be found in a given territory and strengthening competitiveness like skilled workforce or linguistic abilities
2. Demand conditions: competitive large home market can create competitive advantage
3. Related and supporting industries
4. Firm Strategy, Structure, and Rivalry.

World Economic Forum Global Competitiveness Index assesses the competitiveness landscape of 140 economies, and it aims to identify and measure the drivers of their productivity and prosperity. The index groups its indicators into 12 categories, the so-called pillars. These are Institutions; Infrastructure; Macroeconomic environment; Health and primary education; Higher Education and training; Goods market efficiency; Labour market efficiency; Financial market development; Technological readiness; Market size; Business sophistication; Innovation. Economic systems of the countries with developed economy are based on high technologies and innovational goods and services that allow them to be leaders and show high quality of economic growth, while the countries with developing economy are oriented at the existing technologies,

goods, and services, due to which they reach high growth rates with its low quality, establishing their "underdeveloped" position in the global economic system (Alekseev et al., 2018).

However, these products are often not competitive in the foreign market, given their technological achievements. These countries are often criticized for lack of women's leadership skills, factory infrastructure, technological applications, and low levels of modification in line with industry evolution and availability, all of which are identified as the main challenges for this growing country. As the key restraining factor on the path of implementing the strategies of increase of the quality of economic growth in the countries with developing economy is deficit of financial resources, the financial aspect of development of industry 4.0 should be paid special attention (Alekseev et al., 2018). Although this paper presents a regression analysis of the example of Bosnia and Herzegovina, the authors will look at some of the macroeconomic indicators of Bosnia and Herzegovina and the surrounding countries, and compare these indicators with European Union countries. Transition economies provide a particularly fascinating background for entrepreneurship development. Bosnia and Herzegovina, Macedonia, Serbia, and Montenegro are rarely in the sample of transnational analyses of transitional economies. Slovenia was the only former Yugoslav state that was very often involved in the research. Western Balkan economies (Albania, Bosnia and Herzegovina, Former Yugoslav Republic of Macedonia and Montenegro) are relatively small open economies, with an advanced level of trade integration with the EU and CEFTA, with per capita income from medium to low-income levels. Their traditional specialization is in highly-labor intensive industries (clothing, textiles, and leather) and the transformation sectors (melting, metalwork and agribusiness). Tourism represents a significant share of GDP in Montenegro, while money transfers play an important role in stimulating domestic demand and smaller investments in Albania and Bosnia and Herzegovina (Dana and Ramadani, 2014).

Table 1 shows the structural and macroeconomic indicators of the Western Balkans countries compared to the European Union, according to Key Figures on Enlargement Countries (2017), which presents an updated series of key statistics for five candidate countries and two potential candidates, as well as EU-28 data for a period of 10 years (2007 - 2017). Table 1 shows selected indicators that can be read from column one to compare them between the five selected accession countries as well as the EU-28. Table 1 does not include ten years, but only the last observed year, i.e. 2017, but will be mentioned below for some indicators and changes occurring over ten years, according to data available at Eurostat. [1]Population and population structure statistics are increasingly used to support policymaking and provide opportunities for tracking demographic behaviour within the economic, social and cultural context. The population of the observed countries (Bosnia and Herzegovina, Albania, Serbia, Montenegro, and Macedonia) is estimated at 18 million people in 2017 (see Table 1), which is slightly less than 4% of the EU-28 total (508 million people). Serbia has the largest population of 7.114 million, out of 5 observed countries (outside the EU), and Montenegro is the smallest country with 622 thousand inhabitants. The number of inhabitants in Montenegro and the former Yugoslav Republic of Macedonia grew at a modest pace, increasing by 1.4% and 1.7% respectively; which was slower than the corresponding rate of change in the EU-28, where the population grew by 2.8%. Albania has the lowest GDP per capita (BiH has EUR 3,800 in GDP, and Albania EUR 3,600 in GDP).

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[1] http://ec.europa.eu/eurostat/statisticsexplained/index.php/Enlargement_policy_and_statistical_cooperation

Table 1 Structural and macroeconomic indicators of Balkan countries compared to EU countries, 2017

		EU	Bosnia and Herzegovina	Serbia	Montenegro	Albania	Macedonia
Population in millions		508 451	3 819	7 114	622	2 892	2 069
GDP p.c (euro)		28 800	3 800	4 700	5 800	3 600	4 400
Employment rate (people from 20 to 64)		70,1	43,2	56,0	56,7	59,3	51,9
Balance sheet % of GDP	Products	0,9	- 26,0	-19,9	- 40,4	-22,4	- 20,1
	Services	1,0	7,3	2,2	21,8	5,1	3,8
FDI	Inflows	118 944	264	2 114	630	890	157
	Outflows	96 071	43	310	11	72	-14
Trade balance with EU-28	Export in EU	-	3 291	7 672	113	1 303	3 126
	Import from EU	-	4 930	8 266	760	2 398	3 586

Source: author, according to Key figures on enlargement countries, edition 2018, Eurostat

The European Union has a 3.7 times bigger GDP than Bosnia and Herzegovina. The EU-28 employment rate for people between the ages of 20 and 64 was 70.1% in 2017, in other words slightly over three-quarters of people aged between 20 and 64 were employed. Employment rates in the enlargement countries were generally much lower than in the EU-28. In 2017, the overall employment rate among the enlargement countries ranged from 59.3% in Albania to 43.2% in Bosnia and Herzegovina for people aged 20 to 64 years. Balance of Payments is a record of some international business transactions with the rest of the world. The current account balance is made up of several components, and in Table 1 there are two of them, including trade in goods and services. In 2017, EU-28 recorded a positive balance for goods and services, while all expansion countries reported a negative balance of goods and a positive balance for services. The current account deficit is relatively large in most enlargement countries, reaching -40.4% of GDP in Montenegro. On the other hand, Montenegro accounts for the largest surplus of the current account for services (21.8% of GDP), mainly as a result of tourist sector arrivals. In terms of FDI, outflows from EU-28 (non-member countries) amounted to EUR 96 billion in 2017, while non-member inflows amounted to EUR 119 billion. Each of the enlargement countries also recorded a higher level of foreign direct investment inflow than outflow.

Doing Business provides an aggregate ranking of "ease of business" for small and medium businesse. Economies are ranked from 1 to 190 according to "ease of operation" and indicators of metrics. Under conditions of business start-up ("business ease"), Bosnia and Herzegovina ranked 131 among the world's 189 world economies, in 2015 it was 107th, while in 2012 it occupied the 110th place.[2] Falling on the ladder is not necessarily the result of failure to comply with regulations and the lack of progress; this is large since other countries covered by the analysis are moving faster in adopting and implementing regulations and economic reforms. According to the Doing Business report for 2017[3], BiH ranked 81st out of 190 countries in terms of ease of business, where there was a deterioration compared to the previous year when BiH ranked 79th out of 189 countries. BiH is best placed within the framework of cross-border co-operation indicators and is ranked 36th in the global list, where the time and cost of exporting and importing goods as well as documentation itself is reduced. This improvement in rank has mostly contributed to improvements in the cross-border trade system, whereby the time and costs of exporting and importing goods as well as the documentation themselves are greatly reduced.

The business environment is still burdened with numerous administrative barriers at various levels of government. Certain progress has been made in asset registration, but companies

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[2] Business, D. (2009). Doing Business, 2015. *The World Bank: Washington, DC*.
[3] World Bank. (2016). *Doing Business 2017: Equal opportunity for all*. World Bank Publications.

still have to register in both entities if they want to operate throughout the country, registration procedures are still different and there is no registration system for the entire Bosnia and Herzegovina. Procedures for opening new companies, the process of obtaining licenses, time and costs are still long and are one of the worst points of our country's competitive ability, which is also rejected by foreign investors. Particular difficulties in the field of competitiveness are related to the beginning of a business, i.e. the start of business where, according to the World Report "Doing Business for 2016", it is stated that starting a business in Bosnia and Herzegovina should go through 11 procedures that need 37 days. After that, for the granting of permits, 15 procedures in 179 days and the time needed for access to electricity for 125 days (Bosnia and Herzegovina, Bosnia and Herzegovina Development Report - Directorate for Economic Planning, 2016) must be passed. Table 2 shows how Bosnia and Herzegovina was ranked in the period from 2014 to 2016 according to the "ease of operation" and the indicator of measurement regulations. Thus, it can be seen that in 2014 it occupied the 174th place of 189 world economies for the "start of business" indicator, in 2015 it was in 147th place and 2016 in 175th place. Regarding, for example, "solving insolvency", it can be noticed that Bosnia and Herzegovina were significantly better ranked in 2016 than in 2014, as well as in "cross-border trade". However, when it comes to "paying taxes", in 2015, from 97th place in the list of 189 world economies, Bosnia and Herzegovina climbed to 15th place in 2016.

Table 2 Indicators of conditions for start-up and business operation according to "Ease of Business" in Bosnia and Herzegovina (in days)

Country Bosnia and Herzegovina	2014	2015	2016
Start of business	174	147	175
Attaining construction permit	175	106	171
Access to electricity	164	156	119
Registration of ownership	96	106	97
Getting a loan	73	44	42
Investors protection	115	19	66
Taxes payments	135	97	154
Cross-border trade	107	24	28
Conducting the contracts	115	116	-----
Solving insolvency	77	43	36

Source: author, according to http://www.doingbusiness.org/~/media/WBG/DoingBusiness/ Documents/Annual-Reports/English/DB16-Full-Report.pdf

Table 3 Indicators of conditions for start-up and business operations according to "Ease of Business" in the Balkans, 2017 (in days)

Country	Albania	BiH	Crna Gora	Hrvatska	Makedonija	Srbija
Start of business	46	174	58	95	4	47
Attaining construction permit	106	170	93	128	11	36
Access to electricity	156	123	167	68	29	92
Registration of ownership	106	99	78	62	48	56
Getting a loan	44	44	7	75	16	44
Investors protection	19	81	42	27	13	70
Taxes payments	97	133	57	49	9	78
Cross-border trade	24	36	43	1	27	23
Conducting the contracts	116	64	41	27	36	61
Solving insolvency	43	41	40	54	32	47

Source: author, according to http://www.doingbusiness.org/~/media/WBG/DoingBusiness/ Documents/Annual-Reports/English/DB17-Report.pdf

Compared with neighbouring countries, Bosnia and Herzegovina is ranked the worst and in terms of ease of doing business in the 81st place (1-190). Companies face a range of internal weaknesses and constraints in terms of low knowledge of new technologies, access to funding sources, low negotiation power, low productivity, lack of entrepreneurial skills and lack of knowledge related to adequate staff management. Factors that improve the company's performance are related to the stable business conditions that do not hobble but encourage entrepreneurial initiative.

2. USED METHOD AND DATABASE

The paper aims to analyse the interdependence between the development of ICT companies and infrastructure, the education system, the installation of technologies, the lack of government supports and the growing trend of depopulation. Starting from the previous considerations about the Industry 4.0 framework and the changes that digital transformation will induce in the economy of the developing country, we propose the following model:

$$ICTCOMP_t = \alpha + \beta_1 STARTUP_t + \beta_2 TIMEBUSS_t + \beta_3 INFRASTR_t + \beta_4 MIGRPERC_t + \beta_5 HIGHEDU_t + \varepsilon_t$$

where ICTCOMP is the ICT companies, t time period; STARTUP (Start-up procedures to register a business - number), TIMEBUSS (Time required to start a business - days), INFRASTR (Infrastructure - Rank out of 139), HIGHEDU (Higher education and training - Rank/137), MIGRPERC (Stock of emigrants as percentage of population) ε_t standard error; α constant; $\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$ and $\beta 5$ parameters to be evaluated. Statistical data underlying come from the World Bank, Migration and Remittances Factbook, and the used reports of the Statistic Agency of Bosnia and Herzegovina. For establishing how the independent variables influence the number of ICT companies, the used research method implied ten years period from 2007 to 2017, processed with SPSS. The sample includes key indicators of Bosnia and Herzegovina and the period between 2007 – 2017.

Table 4 View of the observed variables in Bosnia and Herzegovina model for the period 2007-2017

Variables	Indicators	Source
ICTCOMP	ICT companies (2007-2017)	Statistical Agency of BiH
STARTUP	Start-up procedures to register a business (number)	World Bank
TIMEBUSS	The time required to start a business (days)	World Bank
INFRASTR	Infrastructure - Rank out of 139	World Bank
MIGRPERC	Rate of emigrants as a percentage of the population	Migration and Remittances Factbook
HIGHEDU	Higher education and training - Rank/137	World Bank

Table 5 Descriptive statistics

	Mean	Std. Deviation	N
ICT companies (2007-2017)	827,0909	309,88916	11
Start-up procedures to register a business (number)	13,1818	,40452	11
Time required to start a business (days)	89,0000	9,50789	11
Infrastructure (Rank out of 139)	121,6364	16,30505	11
Higher education and training (Rank/137)	87,2727	11,95902	11
Rate of emigrants as percentage of population	41,1182	3,27103	11

2.1. Using the Multiple regression model for analyzing interdependence between ICT companies and independent variables

In order to achieve the multifactorial linear model, the analysis aimed the tendency line of the ICT companies, expressed in numbers of company per year depending on Stock of emigrants as percentage of population, Higher education and training (Rank/137), Start-up procedures to register a business (number), Time required to start a business (days), Infrastructure (Rank out of 139), Urban population (% of total) (2007-2017) separately taken, building, for this purpose, unifactorial linear econometric models (Figure 1). Variables which have the most influence on ICT companies will be presented. From the analysis of the tendency line it can be noticed that the value of the multiple determination coefficient (R^2) shows that, in the proportion of 66,6 %, ICT companies are influenced by the time required to start a business (in days).
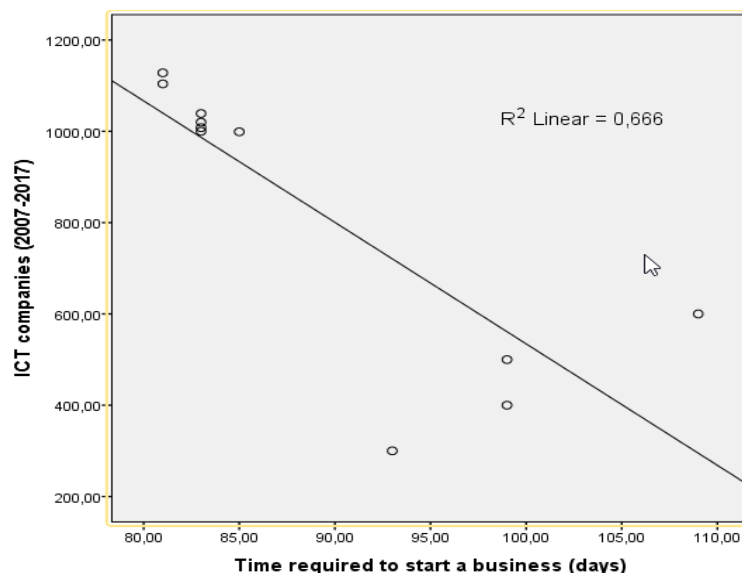

Figure 1 ICT companies depending on time to start a business

Figure 2 present the value of the multiple determination coefficient (R^2) which shows that in the proportion of 63,1 % ICT companies are influenced by the rate of emigration.
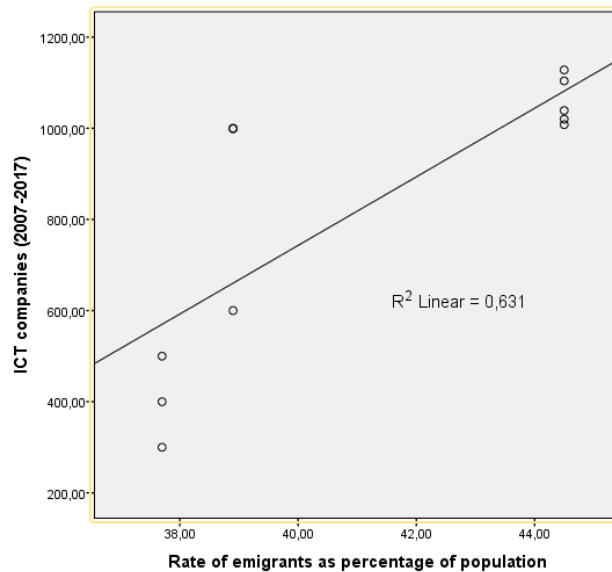
Figure 2 ICT companies depending Emigration rate

2.2. Testing the interdependence and intensity between variables

To measure the interdependence and also the intensity between the resultative variable and the factorial variables, we shall calculate the coefficients of multiple correlations (R), and for determining the percentage with which five independent variables influences the ICT companies some coefficients of determination shall be established (Table 6.)

Table 6 Statistics of the regression, 2007 – 2017

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,992ᵃ	,984	,968	55,43772	,984	61,493	5	5	,000

a. Predictors: (Constant), Start-up procedures to register a business (number), Higher education and training (Rank/137), Migration, Time required to start a business (days), Infrastructure (Rank out of 139)

b. Dependent Variable: ICT companies (2007-2017)

From the analysis of data displayed by the SPSS (Table 6.) it results that the value of R is rather high, respectively 0,992, a value showing that there is an intense connection between ICT companies and independent variables. The analysis of the connection between variables using the R^2 highlights that 98,0 % of ICT companies were influenced by the proposed independent variables, and 2,0 % of ICT companies are influenced by other random factors, while the standard error (Se) of the model is 55,437.

Thus, β_0 takes values from the range [– 3654,585; – 333,094], β_1 from the range [-14,467; -6,540], [-48,126; -87,401], β_3 from the range [-3,206; 4,257], β_4 from the range [-18,002; -5,132], β_5 from the range [- 30,692; - 260,138]. We may notice that the threshold of significance (Sig.), for each coefficient is lower than 0,05, except for variable that represent Infrastructure, which is p = 0,732, and showing that there is statistically significance between the dependent variable and independent variables (Table 7.).

Table 7 Value of the model coefficients, 2007 – 2017

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	-1993,839	646,058		-3,086	,027	-3654,585	-333,094		
	Higher education and training (Rank/137)	-10,504	1,542	-,405	-6,813	,001	-14,467	-6,540	,563	1,776
	Rate of emigrants as percentage of population	-67,764	7,639	-,715	-8,870	,000	-48,126	-87,401	,306	3,263
	Infrastructure (Rank out of 139)	,526	1,452	,028	,362	,732	-3,206	4,257	,342	2,927
	Time required to start a business (days)	-11,567	2,503	-,355	-4,621	,006	-18,002	-5,132	,338	2,960
	Start-up procedures to register a business (number)	-145,415	44,629	-,190	-3,258	,022	-30,692	-260,138	,587	1,703

a. Dependent Variable: ICT companies (2007-2017)

The estimated equation is:

$\hat{Y} = -1993,839 - 10,504x_1 - 67,764x_2 - 11,567x_3 - 145,415x_4$

After the verification of the multicollinearity between the independent variables (Table 7.), we found that the value of the variance inflation factor (VIF) is of 2,960, lower than 5, Tolerance is higher than 0,2, leading to the conclusion that between independent variables there is no direct connection, these variables do not influence each other, and we may build a model. In table 8. can be seen in the residues (Rs) showing the minimum (Min.) value and the maximum (Max.) value of standard deviations (Sd).

Table 8 Statistics of the residues for the model, 2007 – 2017

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	292,6270	1102,2905	827,0909	308,34132	11
Residual	-69,53670	48,84180	,00000	30,93418	11
Std. Predicted Value	-1,733	,893	,000	1,000	11
Std. Residual	-1,589	1,116	,000	,707	11

a. Dependent Variable: ICT companies (2007-2017)

The analysis highlights the predicted value of ICT companies, knowing independent variables, is of 827,0909 with a minimum of 292,6270 and a maximum of 1102,2905. It results that the deviation from the model is in minus with 69,53670 Be plus with 48,8418 Be. The average and the Sd of these variables is rather high ± 30,934 respectively ± 308,341.

Table 9 Analysis based on the ANOVA table, 2007 – 2017

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	950743,673	5	190148,735	99,354	,000[b]
	Residual	9569,236	5	1913,847		
	Total	960312,909	10			

To test the model validity, we are using F - test, based on the theoretical repartition Fisher – Snedecor (F). The empirical value of the F-test based on the ANOVA table is F = 99,354. At the level of significance α = 5% F_{tabel} = 5,12. Since the F_{tabled} < $F_{calculated}$ = 99,354, the null hypothesis is rejected in favour of the alternative one, and the chosen model is considered as significant from the statistical point of view. The model validity and the strong connection between the variables are also supported by the threshold of significance (Sig. F) Significance F < 0,000.

3. DISCUSSION

The coefficient value has shown that there is a strong and direct link between the dependent variables and the four independent observed variables. The proposed model can be used to determine the additional values of ICT companies in Bosnia and Herzegovina, pointing to the importance of reduced administrative obstacles that negatively reflect the growth of ICT companies. When it comes to starting a business and the length of its establishment, Bosnia and Herzegovina is ranked 175th out of 190 countries in 2018.[4] In addition to the length of enterprise creation and complex procedures, there is also the education system as one of the key competitiveness indicators. According to research results, it had a significant impact on the establishment of ICT companies in Bosnia and Herzegovina. According to the Global Competitiveness Report,[5] education implies a general level of skills in workforce, quantity, and quality of education. Although the concept of quality of education is constantly evolving, important quality factors today include the development of digital literacy, interpersonal skills and the ability of critical and creative thinking. Research findings indicate that there is a negative link between the number of ICT companies and the variables of education. Namely, Bosnia and Herzegovina, according to the new Global Competitiveness Report (2018), is ranked 87th among the 140 countries in terms of skills and the quality of education. What is worrisome is the fact that Bosnia and Herzegovina deteriorated its position compared to 2017 when it was the 83rd position. Also, the Competitiveness Indicator in which Bosnia and Herzegovina has the worst result (position 133) refers to the skills appraisal of the graduates who are required by the companies. This all suggests that the education system in Bosnia and Herzegovina does not allow labour competitiveness and that there is no compatibility between the supply of education structure and labour demand in terms of knowledge, expertise, and abilities. When it comes to population emigration, it is expected that it will harm the development of the ICT sector. Apart from being educated in Bosnia and Herzegovina, it is not tailor-made to the needs of the IT sector, i.e. it does not "produce" a sufficient number of high-skilled IT staff, IT companies are also losing experienced professionals. According to research and data obtained from a member of the IT company "BIT Alliance", in the past 12 months, 4.5% of the total number of IT employees (about 150 experts) left the country.[6]

4. CONCLUSIONS AND FUTURE RECOMMENDATIONS

Industry 4.0 will affect all sectors and disciplines, bring structural transformation into a global economy and lead to a new divide that will have a tremendous impact on developing countries. Although ICT is emerging in Bosnia and Herzegovina, however, the initiatives of individuals launching the ICT industry need to be supported by strategic initiatives in the context of future IT legislation development in Bosnia and Herzegovina to have long-term potential. There is a question of the readiness of Bosnia and Herzegovina and other developing countries for the new industrial revolution. Although most developing countries pay attention to the development of science and technology, initiatives have not been implemented appropriately. Low university research results, as well as insufficient intellectual property production, means that these countries are still poor in innovation. If we take for an example export of IT services in the context of

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[4] http://www.doingbusiness.org/content/dam/doingBusiness/media/Annual-Reports/English/DB2018-Full-Report.pdf
[5] http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf
[6] BIT Alijansa

participation in total exports, all countries in the region are better positioned than Bosnia and Herzegovina which occupies 77th place on the world rank. Other countries occupy these places: Romania 18, Albania 21, Serbia 26, Macedonia 37, Bulgaria 41, Montenegro 45, Croatia 50.

The basic condition for a better position of Bosnia and Herzegovina when it comes to the quality of the workforce is to change the quality of education that will contribute to the creation of a critical mass of adequately trained experts. Due to the long and complicated process of opening a business, the World Bank's last Doing Business list has reached Bosnia and Herzegovina's 183rd place in 190 countries. Low ranked because opening an enterprise on average requires as many as 81 days and 13 procedures, so the start-up process should be more efficient and faster. Also, business transformation on the basis of digital models will make possible to reach an absolutely different level of product and services creation and promotion, to provide the optimal quality of services to clients and the efficiency to companies and enterprises (Kupriyanovsky et al., 2017). However, such transformation necessitates substitution of traditional managerial approaches, principles and values to the models with priority goals and economic system's success criteria being not the profit or short-term efficiency, but client focus, innovation, new project realization rate, cooperation with suppliers and partners.

For future recommendation, authors suggest testing these variables in other developing countries, also including other indicators such as capacity innovation, research and development expenditure, unemployment rate and cooperation in labour-employer relations.

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