www.sjm06.com

Serbian Journal of Management 17 (1) (2022) 111 - 123

Serbian Journal of Management

CURRENT STATE AND PREDICTION OF THE FUTURE OF DIGITIZATION AS A PART OF INDUSTRY 4.0

Anna Zaušková*, Alena Kusá, Michal Kubovics, Simona Ščepková and Marianna Urmínová

The Faculty of Mass Media Communication, University of Ss. Cyril and Methodius in Trnava, Nám. J. Herdu 577/ 2, 917 01 Trnava, Slovak Republic

(Received 15 February 2022; accepted 23 March 2022)

Abstract

The world has changed as a result of the expansion of Industry 4.0. Big data, machine learning or automation and robotics dominate almost all business entities. As a result of the digital revolution, we are seeing a boom in the application of various digital techniques. To achieve profitability, eliminate losses and start-up costs, as well as to improve competitiveness, businesses implement digitization in various company processes. The aim of this paper is to map and clarify the interaction between Industry 4.0 and digitization. The result is a content analysis, with which we will point out the importance of applying the principles of digitization at a practical level. The paper reflects an examination of the current state of the digital boom and its impact on small and medium-sized companies. The main benefit of this paper is to examine and point out the current level of digitization of the surveyed business entities through our own questionnaire survey. We selected the area of digitization from the collected results, specifically five research questions were determined for the analysis, which we identified before the questionnaire survey. A questionnaire survey was also conducted in Bulgaria, Serbia and the V4 partner countries.

Keywords: digitization, present phenomenon, small and medium enterprises, online marketing communication, industry 4.0

1. INTRODUCTION

"Change is the law of life and those who look only to the past or present are certain to miss the future." J. F. Kennedy

Businesses need to respond to the technological changes we are seeing in a dynamically changing digital environment. The last industrial revolution, known as Industry 4.0, was a revolution that changed

* *Corresponding author: anina.zauskova@gmail.com*

DOI: 10.5937/sjm17-36468

the world globally. The rise of the digital revolution has brought about changes in various industries. The digital industrial revolution was preceded by three revolutions. This paper deals with the rise of digitization up to its current cross-section, in which observe an increase in the use of digital technologies.

2. LITERATURE REVIEW

In our opinion, it is appropriate to define the industrial revolution from the times before the arrival of the first industrial revolution. Before 1760, there was a boom in handicraft production, which was associated with the emergence of various markets. Markets were once the only sales channel where sellers met buyers and demand for products was formed (Turner, 2021). As Crafts (2019) states in his publication, the essence of the first industrial revolution was the introduction of machines, which is associated with an increase in its coefficient of growth. The areas most affected by the emergence of the first industrial revolution were the textile industry, but also agriculture, mining, glass production, transport and the like (Lasi et al., 2014).

Following the development of the production concept of the first industrial revolution, the second industrial revolution took place, which can be dated from 1870 to 1914. The second industrial revolution focused on the expansion of electricity, oil and steel. This period was characterized by a boom in innovation in the form of faster transport, i.e. with the emergence of rail transport. A revolutionary innovation, which is also explored by the authors Kocdar et al. (2020) was the introduction of electricity into production processes. Against this background, the concept of rapid electronic communication and mass production developed in the era of the Second Industrial Revolution. Given the fact that one of the main advances of the Second Industrial Revolution was the production of the electric generator, which over time replaced water and steam engines, we can follow up on the third revolution in the field of industry.

The Third Industrial Revolution focused on the proliferation of the Internet and microelectronics, influencing economic development and the subsequent advancement of production due to the implementation of information and automation technologies (Taalbi, 2019; Krajčovič & Čábyová, 2020). We observe that the third industrial revolution is based on the concept of electronics, which is followed by Industry 4.0.

The essence of the fourth revolution was the connection of physical components with digital technologies. According to the authors Majiwala et al. (2019), the fourth industrial revolution dates back to 2011. Several authors also refer to the industrial revolution as the digital technology revolution. It is based on important results and knowledge of the second industrial revolution (Atwell et al., 2019). It connects production systems that use computer technologies that can be further disseminated via a network connection (Catal & Tekinerdogan, 2019). The Fourth Industrial Revolution brought with it new terms such as IoT (Internet of Things), artificial intelligence (AI), robotics, 3D printing, robots, drones or cloud or mobile computing (Li et al., 2017). A significant change brought about by the Fourth Industrial Revolution was digitization, which helped saturate the labour market in terms of the involvement of qualified human resources,

which enabled the improvement of various systems at several levels in the field of information and communication. Industry 4.0 evolved according to a pre-planned concept, which is not the case with the previous three revolutions. However, there is no consensus on the stimuli that shape the development of technological systems in the real world (Taalbi, 2019). The development of industries at the global level of the fourth industrial revolution is fascinating, but in connection with digitization it can also be frightening. This industrial revolution should, on the one hand, change the quality of life for the better, but on the other hand, digitization cannot provide quick answers to problems, or optimization of vertical production processes (Alaloul et al., 2018).

2.1. Digitization offers new opportunities

Various global authors write about the marked impact of digitization on the whole of society not only in the field of industry (Bouwman et al., 2018; Švec et al., 2021). The boom in digitization provides incentives to increase the performance of differently oriented businesses and we can say that it is essential for the functioning of a healthy competitive environment, but also for the advancement of businesses in the field of innovation performance. In their publications, Linde et al. (2021) discuss the complexity of profiting an entity from digital business models. Recent advances in digitization highlight its dominance and major impact on business across all sectors. As Urbi et al. (2019) states in their publication the most visible changes resulting from digitization are observed mainly in the provision of information systems and services, in the field of manufacturing (especially the automotive industry) and as defined Mirskikh (2022) in the field of healthcare but also in the field of education as defined Drugova (2021) which has been digitized mainly due to the coronavirus epidemic.

There is no doubt that digital technologies are one of the biggest phenomena in various industries today. The presented paper focuses on examining the current situation of digitization in small and medium-sized enterprises in Slovakia, Serbia, Bulgaria and other V4 countries.

3. METHODOLOGY

The article entitled "Digital boom of Industry 4.0 in small and medium-sized enterprises" aims to clarify the attitudes and current situation of digitization in the context of Industry 4.0 in small and medium-sized enterprises. The authors of the article carefully defined the research problem, on the basis of which they defined the research questions that they verify through their own scientific research. The theoretical level of the paper consists of secondary sources. Scientific articles, contributions and studies have come from leading scientific databases with high rankings. The texts examined and evaluated came mainly from scientific articles, journals, proceedings and also from leading scientific conferences and articles from prominent experts in various fields. The presented paper contains both primary and secondary data sources. The primary source of solutions to the problem is a questionnaire survey. The survey is conducted in the countries of Hungary, Poland, Slovakia, the Czech Republic, Serbia and Bulgaria. The Slovak version was implemented on a sample of 100 respondents (100%). The age

of respondents was in the range of 18 to 30 years in the frequency of 22 respondents (22%), followed by the age composition 31-45 in the frequency of 30 respondents (30%), another represented age category was in the range of 46-60 in the frequency of 32 respondents (32 %), the last age group was 61 years and older, with a frequency of 16 respondents (16%). The sex of the respondents was 53 men (53%) and 46 women (46%). One respondent did not wish to answer (1%). Respondents showed a certain position in connection with the business entity. For better specification, it was the position of an employee in the frequency of 18 respondents (18%), the data package contains the most numerous representation of the manager in the frequency of 35 (35%), senior manager in the frequency of 25 (25%) and owner with a frequency of 22 (22%). The education of the respondents was represented as follows: education at the secondary school level at a frequency of 15 (15%) was followed by the first stage of university with a frequency of 11 respondents (11%), the second stage of university with a frequency of 71 (71%) and the third stage of university with a frequency of 3 respondents (3%). Business entities, through respondents, showed a certain degree of company size through the number of employees. Less than 9 employees stated 62 respondents (62%), followed by a range between 10-49, where the frequency was 21 (21%), followed by a range of 50-249 where the frequency was 8 (8%) and finally more than 250 in the frequency 9 (9%). Overall, the business entities represented by the respondents stated that the company's total assets are below EUR 2 million at a frequency of 73 (73%) as the most numerous representations. Subsequently, from 2 to 10 million Euros they are at a frequency of 17 (17%). In the lowest proportion, respondents reported a value of between € 10 and € 43 million at a frequency of € 4 (4%). The last mentioned item of 43 million Euros and more was marked by 6 respondents (6%). Another metric that was asked was the duration of the business entity in the market. The value up to two years was indicated in 24 cases (24%), and then from 3 to 5 years the frequency was 8 (8%). Subsequently, from 6 to 10 years of operation, the frequency was 21 times (21%). From 11 to 20 years of age, the frequency was 21 (21%) and in the last response of 21 years or more, the response was 26 (26%). The dominant segments of business entities were represented in the frequency of 42 (42%) in production, subsequently in trade with the frequency of 18 (18%) and as the last representation of respondents in services 40 (40%). Within the activities of business activities, the respondents mentioned agriculture with a frequency of 7 (7%), followed by mining and quarrying with a frequency of 8 respondents (%), machinery and equipment with a frequency of 8 (8%). This was followed by construction and developers with a share frequency of 14 (14%), followed by wholesale and retail with a frequency of 16 (16%), information and communication with the number of 26 (26%). Respondents representing business entities also mentioned production with 9 (9%) followed by finance and insurance with a frequency of 4 (4%) and as the last industry including energy with 2 (2%) the question was also answered by another sector with 6 (6%). The research group of compared countries was represented by the Czech Republic with a frequency of 87 respondents, Hungary with a frequency of 110 respondents, Poland with a frequency of 101 respondents, Serbia with a frequency of

134 and Bulgaria with a frequency of 101. Conclusions and discussion are formulated on the basis of the theoretical background and our own questionnaire solution.

Research topic: The state of use of digitization as a part of Industry 4.0 in business entities.

RQ 1: We assume that business entities want to digitize to a greater extent in Slovakia.

RQ 2: We assume that a smaller number of business entities in Slovakia are concerned about digitization.

RQ 3: We assume that Slovakia is in the same situation in comparison with other countries, and a smaller part of business entities in other countries is concerned about digitization.

RQ 4: We assume that companies in Slovakia plan to invest more in digitization in the future.

RQ 5: We assume that there is a relationship between the number of employees in Slovak business entities and the prediction of business entities that they will introduce greater digitization in the near future.

In this paper, the statistical method of Spearman's correlation coefficient is used to determine the relationship between ordinal variables.

$$r_s = \rho\left(R_x, R_y\right) = 1 - \frac{6\sum_{i=1}^{n} D_i^2}{n\left(n^2 - 1\right)} \quad (1)$$

where D_i is the order differences R_{xi}, R_{yi} and n is the range of selection.

IBM SPSS 22 software was used for statistical analysis.

4. RESULTS

The final part brings conclusions in the form of evaluation. The following are the results in the form of evaluation of the questionnaire solution. Research question 1 was confirmed. Businesses intend to apply digitization to an increased extent in the near future. Table 1 shows the mean, median, and most common mode values. 100 answers are valid. The translated question has an ordinal character and is rated on a Likert scale from 1 to 5. 1 is "I do not agree at all" and 5 is "I strongly agree". The average is 3.1, which confirms the research question that most respondents stated, neutral and closer to the confirmatory answer. The median is at level 3 and the most common value is also at level 3.

The Table 2 explains the values for the individual frequencies and percentages. A value of 1 is represented at a frequency of 6 and a percentage of 6%. This was followed by a value of 2 with a frequency of 15 and a percentage of 15%. The next value is 3 with a frequency of 53 as the most numerous value in the result part of the first question with a proportion of 53%. The next value is 4 at a frequency of 15 and a proportion of 15% and the last value is 5 at a frequency of 11 and a percentage of 11%. From the results, it can be concluded that half to more than half agree and respondents agree that businesses want to digitize more in the near future.

The Tables 3 and 4 interpret the answers to the question of concern about the digitization of businesses. Respondents could mark the result with a value from 1 to 5, i.e. a Likert scale. In the value of 1, the representation of the answer was "strongly disagree" and on the other side of the scale with the number 5 "strongly agree". The

Table 1. Analysis of the question "My company predicts that it will introduce more digitization in the near future."

N	**Valid**	100
	Missing	12
Mean		3.10
Median		3.00
Mode		3

Table 2. Analysis of the question "My company predicts that it will introduce more digitization in the near future."

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	1	6	5.4	6.0	6.0
	2	15	13.4	15.0	21.0
	3	53	47.3	53.0	74.0
	4	15	13.4	15.0	89.0
	5	11	9.8	11.0	100.0
	Total	100	89.3	100.0	
Missing	System	12	10.7		
Total		112	100.0		

Table 3. Analysis of the question "I feel apprehensive about digitization."

N	**Valid**	100
	Missing	12
Mean		2.76
Median		3.00
Mode		2
Minimum		1
Maximum		5
Sum		276
Percentiles	25	2.00
	50	3.00
	75	4.00

Table 4. Analysis of the question "I feel apprehensive about digitization."

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	1	13	11.6	13.0	13.0
	2	35	31.3	35.0	48.0
	3	18	16.1	18.0	66.0
	4	31	27.7	31.0	97.0
	5	3	2.7	3.0	100.0
	Total	100	89.3	100.0	
Missing	System	12	10.7		
Total		112	100.0		

Table 3 represents the mean, median and mode. An average of 2.76 was represented in the scoreboard. The median was 3 and the mode was at level 2. The findings show that respondents most often cited a lower value, expressing a neutral to dissenting view on the issue of digitalization concerns. We confirm Hypothesis 2, the number of respondents feels worried than half of the respondents on behalf of business entities.

The Table 4 is devoted to the individual values on the Likert scale. The most numerous value was 2 with a frequency of 35 (35%). On the other side of the spectrum is the value 4, which the respondents indicated at a frequency of 31 (31%). In a detailed analysis, we can speak of a similar mood with agreement with the statement. The neutral attitude is frequently answered by 18 respondents (18%). Responses with a value of 5, which has a frequency of 3 (3%), and for comparison, a value of 1 with a frequency of 13 (13%) are decisive for the rejection or confirmation of the hypothesis. In conclusion, we can talk about a more dominant position on the side of the negative part of the Likert scale. For this reason, we can talk about a hypothesis that has been confirmed and therefore that most businesses are not afraid of digitization.

Another hypothesis is focused on the comparison of Slovakia with other countries in fear of digitization. The comparison specifically concerns the Czech Republic, Hungary, Slovakia, Poland, Serbia and Bulgaria. The Table 5 answers the question of whether respondents feel concerned about digitization. The question shows values on a Likert scale, which makes it an ordinal variable.

The Table 5 shows that the vast majority of business entities on behalf of the respondents marked the values in the highest frequency at levels 3 to 1. The analysis showed when the second most dominant level in the Slovak data package was 4. In the other files the anomaly did not occur.

From the Figure 1, we conclude that the values indicate a greater degree of concern about digitization, but the overwhelming majority in the file show less concern, which brings it in line with other data packages of the compared countries. The hypothesis was confirmed and other countries, compared to Slovakia, also show a low level of concern about digitization. The Tables 6 and 7 are devoted to the research question of whether business entities in Slovakia plan to invest more in digitization in the future. The average values of 3.12 are given. The following is a median value of 3.0 and a mode value of 4.

Table 5. Analysis of the question "The country in which your company operates" and "I feel apprehensive about digitization."

		I feel apprehensive about digitalization.					
		1.00	2.00	3.00	4.00	5.00	Total
The country in which your company operates	Czech Republic	53	15	13	5	1	87
	Hungary	64	17	19	5	5	110
	Slovakia	13	35	18	31	3	100
	Poland	40	32	18	8	3	101
	Serbia	104	17	11	1	1	134
	Bulgaria	63	16	13	4	5	101
Total		337	132	92	54	18	633

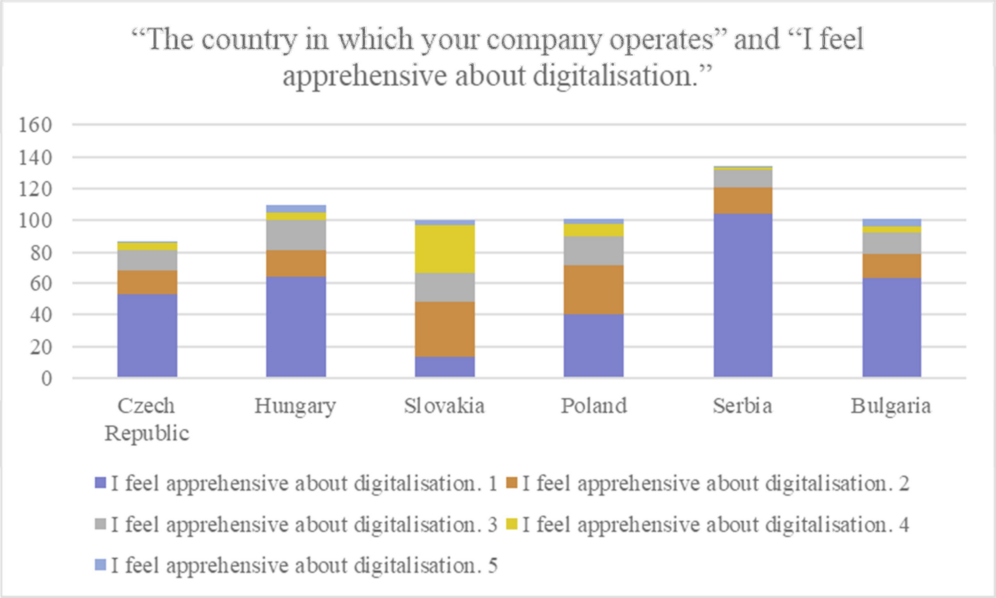

Figure 1. Graph showing the variables "The country in which your company operates" and "I feel apprehensive about digitization."

Table 6. Analysis of the question "Company plans to invest in digitization more in the future".

N	**Valid**	100
	Missing	12
Mean		3,12
Median		3,00
Mode		4
Minimum		1
Maximum		5
Sum		312
Percentiles	25	2.00
	50	3.00
	75	4.00

Table 7. Analysis of the question "Company plans to invest in digitization more in the future".

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	1	8	7.1	8.0	8.0
	2	29	25.9	29.0	37.0
	3	19	17.0	19.0	56.0
	4	31	27.7	31.0	87.0
	5	13	11.6	13.0	100.0
	Total	100	89.3	100.0	
Missing	System	12	10.7		
Total		112	100.0		

The question is defined in interpretive nature as an ordinal variable. The Table 7 records the individual values from 1 to 5. The result of the question is the Likert scale. Individual results are from the most frequent frequency 31 (31%) for the value 4. This is followed by the value 2 with a frequency of 29 (29%). Neutral value 3 reached a frequency of 19 (19%). The penultimate value is 5 as the most significant positive response with a frequency of 13 (13%). The lowest frequency is 1 with a frequency of 8 (8%). The result talks about confirming the research question. The majority of businesses on behalf of respondents gave answers from the positive spectrum and that they agreed with the statement that the business entity plans to invest more in digitization in the future.

The following research question is defined as a precondition for the relationship between the number of employees in business entities and the prediction of business entities in Slovakia that they will introduce greater digitization in the near future (Figure 2).

The results in Table 8 show that in companies with 9 or fewer employees, respondents are more skeptical and the values are more on a neutral to negative answer (3.2). The analysis further revealed that it is characteristic of business entities with 10-49 employees that the values are arranged rather neutral, even up to a positive spectrum (4.5). A similar structure of results is shown by business entities with 50-249 employees as well as business entities with 250 or more employees.

As part of the research question, we requested an answer to the question of the relationship between the examined ordinal variables. In the analysis, we used a Spearman Correlation nonparametric correlation coefficient working with the order of the variables to determine the relationships between the variables (Table 9).

The Table 9 shows the output values p=0.456 and Sig=0.000 (Sig<0.001) from

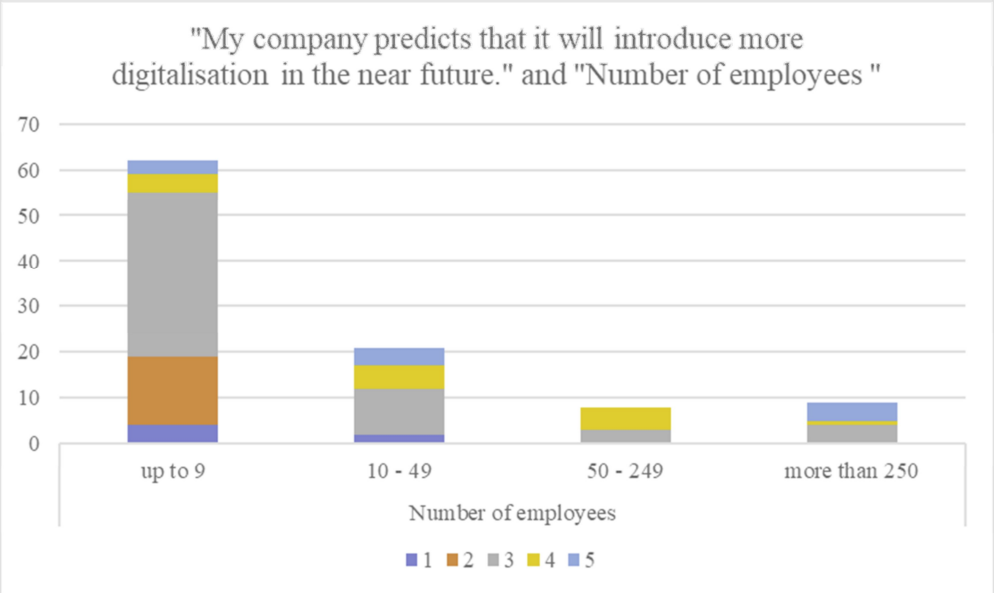

Figure 2. Graph showing the variables "The country in which your company operates" and "I feel apprehensive about digitization."

Table 8. Analysis of the question "Number of employees" in connection with the question "My company predicts that it would introduce more digitization in the near future".

		My company predicts that it will introduce more digitalization in the near future.					
		1	2	3	4	5	Total
Number of employees	up to 9	4	15	36	4	3	62
	10-49	2	0	10	5	4	21
	50 - 249	0	0	3	5	0	8
	more than 250	0	0	4	1	4	9
Total		6	15	53	15	11	100

Table 9. The relationship between the variables "Number of employees" in connection with the question "My company predicts that it would introduce more digitization in the near future".

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Ordinal by Ordinal	Spearman Correlation	.456	.079	5.076	.000[c]
N of Valid Cases		100			

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

which we can infer significance and therefore evaluate the research question as accepted. It is true that there is a significant relationship between the number of employees in business entities and the prediction of business entities that they will introduce greater digitization in the domestic environment in the near future.

5. DISCUSSION AND CONCLUSIONS

The presented paper brought findings in the form of conclusions and we can say that the pre-formulated goals of the paper were met. The basis for the final evaluation, as well as broader conclusions, was based on an examination of the areas of theoretical background that preceded the questionnaire survey in the V4 countries, Serbia and Bulgaria. The research question, which is that "businesses want to digitize more", has been confirmed. In Slovakia, business entities on behalf of respondents have a largely positive attitude towards predictions in digitization in the future. This is followed by a trend that is generally valid not only in Industry 4.0, but also across the world and especially in the countries with the highest populations. According to Mlitz (2021), predictions in investing in digitization are on the rise. This statement is also confirmed by our questionnaire solution. According to Milošević et al. (2021), technological innovations in production can lead to increased efficiency. On the other hand, there may be some concerns on the part of businesses, which may slow down and jeopardize the progress of digitization. The researchers Thaduri (2019) and colleagues

also write about the dangers that can arise as a result of evolving digitization, highlighting the potential challenges, consequences or threats that can arise in the context of cyber security. The research concluded that at the level of the Slovak Republic, only a small number of business entities are concerned about digitization (Jurišová, 2019). As a result, we can conclude that fear and anxiety about the unknown "does not stand in the way" of digitalization. By educating and increasing the presentation of the issues of Industry 4.0 and its parts of digitization, we can also bring enlightenment to other business entities that have appeared in the positive spectrum and are concerned about digitization. Compared to other countries, Slovakia is at a similar level as other countries, and as we have already mentioned, a smaller number of business entities are concerned about digitization compared to other countries. Slovakia shows a slightly higher share of concerns, but other countries show a low rate. Therefore, it is important to operate support activities in this area in Slovakia in order to prevent the phenomenon, and so that digitization in Slovakia can continue to progress. Also, the finding that companies plan to invest more in digitization in the future has been confirmed by the relationship between the number of employees in businesses and the prediction of businesses to introduce more digitization in the near future. As a result, digitization is in demand. Within small and medium-sized enterprises, it will be necessary to choose education and certain awareness in order to introduce digitization in the form of various technologies, processes, etc., even within the stated sizes of enterprises. The findings are an important milestone, which clarifies the current state of the Slovak environment and we further compare it with foreign countries and businesses operating in them. The interpreted findings will help the scientific and commercial spheres in a better understanding of the current state of Industry 4.0, specifically in digitization, where it is possible to further develop all areas and help small and medium-sized enterprises in particular - whether in the creation of systems, processes and technology or with better presentation and communication to the public. Further research is very important and desirable, as it is an unexplored scientific area that has the potential for growth and development, and the findings allow researchers to improve their current level and level of digitization.

Acknowledgement

This paper was supported by the International Visegrad Fund, project number 22110036, titled “Possibilities and barriers for Industry 4.0 implementation in SMEs in V4 countries and Serbia”.

References

Alaloul, W.S., Liew, M.S., Zawawi, N.A.W.W., & Mohammed, B.S. (2018). Industry Revolution IR 4.0: Future Opportunities and Challenges in Construction Industry. MATEC Web of Conferences, 203, 02010.

Atwell, G., Kicová, E., Vagner, L., & Miklenčičová, R. (2019). Parental Engagement with Social Media Platforms: Digital Mothering, Children’s Online Privacy, and the Sense of Disempowerment in the Technology-Integrated Society. Journal of Research in Gender Studies, 9 (2), 44–49.

Bouwman, H., Nikou, S., Molina-

САДАШЊЕ СТАЊЕ И ПРЕДВИЂАЊЕ БУДУЋНОСТИ ДИГИТАЛИЗАЦИЈЕ КАО ДЕЛА ИНДУСТРИЈЕ 4.0

Anna Zaušková, Alena Kusá, Michal Kubovics, Simona Ščepková, Marianna Urmínová

Извод

Свет се променио као резултат експанзије Индустрије 4.0. Велики подаци, машинско учење или аутоматизација и роботика доминирају готово свим пословним субјектима. Као резултат дигиталне револуције, видимо бум у примени различитих дигиталних техника. За постизање профитабилности, елиминисање губитака и почетних трошкова, као и за побољшање конкурентности, предузећа уводе дигитализацију у различите процесе компаније. Циљ овог рада је да мапира и разјасни интеракцију између Индустрије 4.0 и дигитализације. Резултат је анализа садржаја, којом ћемо указати на значај примене принципа дигитализације на практичном нивоу. Рад одражава испитивање тренутног стања дигиталног бума и његовог утицаја на мала и средња предузећа. Основна корист овог рада је да се кроз сопствено анкетно истраживање испита и укаже на тренутни ниво дигитализације анкетираних привредних субјеката. Од прикупљених резултата одабрали смо област дигитализације, а за анализу је одређено пет истраживачких питања која смо идентификовали пре спровођења анкетирања. Анкетирање је, такође, спроведено у Бугарској, Србији и партнерским земљама В4.

Кључне речи: дигитализација, садашњи феномен, мала и средња предузећа, онлајн маркетиншка комуникација, Индустрија 4.0

Castillo, F. J., & de Reuver, M. (2018). The impact of digitalization on business models. Digital Policy, Regulation and Governance, 20 (2), 105–124.

Catal, C., & Tekinerdogan, B. (2019). Aligning education for the life sciences domain to support digitization and industry 4. 0. Procedia Computer Science, 158, 99–106.

Krajčovič, P., & Čábyová, Ľ. (2020). The role of SoLoMo marketing and media in the communication of eco-innovations. Wolters Kluwer. Budepest.

Crafts, N. (2021). The sources of British economic growth since the industrial revolution: Not the same old story. Journal of Economic Surveys, 35 (3), 697–709.

Drugova, E.A. (2021). Digitalization of Education at Russian Universities in 2021: a Growing Window of Opportunity. In Rubtsov, V.V., Sorokova, M.G., Radchikova, N.P. (Eds), Digital Humanities and Technology in Education (DHTE 2021): Collection of Articles of the II All-Russian Scientific and Practical Conference with International Participation. Publishing house MSUPE, Moscow. 589–608.

Jurišová, V. (2019). Environmental Awareness of the Zero Waste Concept and the Possibilities for Its Implementation within the CSR Strategy in Slovak Business Entities. Proceedings of 14th European Conference on Innovation and Entrepreneurship (ECIE 2019), 1, 452 - 459.

Kocdar, S., Bozkurt, A., & Goru Dogan, T. (2021). Engineering through distance

education in the time of the fourth industrial revolution: Reflections from three decades of peer reviewed studies. Computer Applications in Engineering Education, 29 (4), 931–949.

Lasi, H., Fettke, P., Kemper, H.-G., Feldt., & Hoffmann, M. (2014). Industry 4.0. Business & Information Systems Engineering, 6 (4), 239–242.

Li, G., Hou, Y., & Wu, A. (2017). Fourth Industrial Revolution: Technological drivers, impacts and coping methods. Chinese Geographical Science, 27 (4), 626–637.

Linde, L., Sjödin, D., Paria, V., & Gebauer, H. (2021). Evaluation of digital business model opportunities: A framework for avoiding digitalization traps. Research-Technology Management, 64 (1), 43–53.

Majiwala, H., Sharma, S., & Gandhi, P. (2020). Lean and industry 4. 0 strive to create a smart factory through integration of systems: An exploratory review. Nain, V.N., & Vipparthi, S.K. (Eds.), 4th International Conference on Internet of Things and Connected Technologies (ICIoTCT), Springer International Publishing, 12-19.

Milošević, I., Ruso, J., Glogovac, M., Arsić, S., & Rakić, A. (2021). An integrated SEM-ANN approach for predicting QMS achievements in Industry 4.0. Total Quality Management & Business Excellence, in press.

Mirskikh, I., Mingaleva, Z., Kuranov, V., & Dobrovlyanina, O. (2022). Problems and negative consequences of the digitalization of medicine. In: Antipova T. (eds) Digital Science. DSIC 2021. Lecture Notes in Networks and Systems, 381. Springer, Cham.. 445–455.

Švec, M., Madleňák, A., Bezáková, Z., & Horecký, J. (2021). Possibilities and Limitations of Communication of Special Purpose Civic Associations – The Case of Internal Communication of a Trade Union Active in a Company Influenced by the Groundswell Concept. Communication Today, 12 (2), 32-45.

Taalbi, J. (2019). Origins and pathways of innovation in the third industrial revolution1. Industrial and Corporate Change, 28 (5), 1125-1148.

Thaduri, A., Aljumaili, M., & Kour, R. (2019). Cybersecurity for eMaintenance in railway infrastructure: risks and consequences. International Journal of System Assurance Engineering and Management, 10, 149–159.

Turner, P. (2021). Management during the first industrial revolution: European pioneers—the genesis of modern management. Turner, P. (Ed.), The Making of the Modern Manager: Mapping Management Competencies from the First to the Fourth Industrial Revolution. Springer International Publishing, 33–63.