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AWARENESS OF INDUSTRY 4.0 AND ITS TOOLS ACROSS THE V4 COUNTRIES, SERBIA AND BULGARIA

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Abstract

The researched countries, which include the V4 countries, Serbia and Bulgaria, are working to exploit the potential that digitization offers under the Industry 4.0 concept. The rise of Industry 4.0 has resulted in tools such as machine learning, big data, automation, and robotics. In the current environment, we observe it in almost every business entity and across the V4 countries, Serbia and Bulgaria. Awareness of Industry 4.0 continues to grow in the current environment, precisely as a result of the expansion of Industry 4.0. The countries studied are taking Industry 4.0 tools to a new level. To obtain an up-to-date picture of the researched issue, our own questionnaire survey was used, which was used to examine and analyze the current level of Industry 4.0, and the results included in this paper can be compared with the results of the current level of Industry 4.0 in other countries. In order to obtain objective results from the questionnaire survey, five research areas were determined using five hypotheses. The main benefit of the paper lies in the interpretation of the results of the authors' scientific research, which point to the current level and rate of use of Industry 4.0 tools in the defined areas.

Keywords: big data, cloud computing, digitization, IoT, Industry 4.0, Industry 4.0 tools, online marketing

1. INTRODUCTION

According to several authors, digitization was preceded by a marked development of technology, as a result of which digital transformations took place (Verhoef et al., 2021), (Lachvajderová, 2021). In connection with digitization, it is also necessary to state that digital transformation opens up opportunities (Schwertner, 2017) for the

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emergence of new innovations in business processes and business models. The digital transformation has become a key stimulus for innovation in various areas of business. Industry 4.0 can be described as the driving force in several industries, which are constantly being transformed and simplified as a result of digitization, but which also accelerates several production or logistics processes. There is no doubt that there is currently space for further implementation of the elements of Industry 4.0 not only in the V4 regions, but also in Bulgaria and Serbia in the SME environment. The paper aims to determine the current awareness of Industry 4.0 and its tools in the V4 countries, Serbia and Bulgaria. The resulting findings of the paper reflect the current state of awareness of the researched issues in the context of the application of digitization.

2. LITERATURE REVIEW

This paper focuses on exploring the groundswell awareness across the V4 countries, Serbia, Bulgaria. Ivanov et al. (2018) state that intelligent factories based on collaborative cyber-physical systems open up space for the future of Industry 4.0. According to other authors of prestigious scientific publications, digitization integrates a significant part of research that focuses on examining the organizational skills necessary for the transformation of services (Ardolino, 2017). The digital transformation is affecting various industries, such as the automotive, agricultural, clothing, paper and similar industries. Businesses need to be aware of the changes that may occur in the digitization process, and respond quickly and appropriately. Even due to the ubiquitous impact of digital change, we can talk about the resulting digital business models (Venkatrman, 2017). The essence of Industry 4.0 is based on two basic principles, which include the field of digitization and the application of exponential technologies. Awareness of Industry 4.0 can be raised using several digitization tools. The authors Labudová & Jánošová (2019) argue about digitization and its impact, reflecting on the implications of digitization, which connects individuals, organizations, or various devices with technology through new ways that automate and complement each other. It is important to quantify the categories of Industry 4.0 tools and analyze them in terms of the current awareness.

2.1. Categorization of the most influential tools Industry 4.0

The Cyber Physical System (CPS) can be included among the most important factors in the field of Industry 4.0. CPS is a digitization of socio-technical systems that offers bids for a new exploration of the defined field of CPS (Lioutas et al., 2019; Rijswijk et al., 2021). CPS has three basic factors (Sridhar et al., 2011; Weyer et al., 2021), which include communication, calculation and control. It is also important to be able to spread awareness of Industry 4.0 through the Internet of Things (IoT). According to Li et al. (2017) the Internet of Things can be described as a grouping of physical objects and especially devices, the nature of which is based on a specific type of electronics, e.g. in the form of software, various sensors or a cyber-physical system. In the context of the Internet of Things, world-class authors such as Sestino et al. (2020) can be interpreted as defining IoT as a constantly changing technological paradigm that needs to be constantly

explored. Internet of Services (IoS) can be described as a structure that uses the Internet to sell services, which can also be a way of spreading awareness about Industry 4.0 (AL-Salman & Salih, 2019). In the field of IoS, marketing communication has a significant position, especially because of mutual cooperation, which is a suitable stimulus for building awareness. In this context, it is also appropriate to define the area and issues of Big Data. In today's environment across the V4 countries (Czech Republic, Hungary, Poland, Slovakia), Serbia and Bulgaria, several reasons for the existence of big data can be defined, but in view of the increasing number of cyber-attacks, it is also appropriate to consider the consistency and completeness of the data. Processing a large data set may appear inefficient, making advanced high-precision analytical techniques necessary to examine future procedures (Hariri et al., 2019). The services and products that are available on servers through an Internet connection are referred to as Cloud Computing. We believe that Cloud Computing (CC) and related security issues, as well as countermeasures, are among the most common areas in the current environment of different regions and countries (Basu et al., 2018), as CC has become an innovative technology that makes it possible to provide services and products over the Internet (Alam, 2020). Based on the analysis of available resources, we can confirm that digital tools undoubtedly help to raise awareness of the groundswell, which we also point out through the interpretation of the collected data. The presented paper focuses on examining the awareness of Industry 4.0 of the current situation of digitization in small and medium-sized enterprises in Serbia, Bulgaria and other V4 countries. We believe that further a research of this issue is necessary for a deeper understanding and making recommendations.

The aim of this paper is to evaluate awareness of Industry 4.0 and its tools in the V4 countries, Serbia and Bulgaria and to identify the barriers that will be the basis for further research. Based on the set goal, the following research topic is defined.

Research topic: Awareness of Industry 4.0 and its tools across the V4 countries, Serbia and Bulgaria.

Based on the theoretical framework and research topic, hypotheses were defined that verify individual phenomena and researched factors.

H1: SMEs in Slovakia are aware of the concept of Industry 4.0.

H2: Compared to Slovakia with other V4 countries, Serbia and Bulgaria, more than half of all business entities are aware of Industry 4.0. (Authors are from Slovakia)

H3: Business entities represented by respondents are familiar with Industry 4.0 tools.

H4: Businesses are familiar with big data tools in Industry 4.0.

H5: There is a significant relationship between the size of companies in terms of number of employees and familiarity with the elements of Industry 4.0.

3. METHODOLOGY

The research design of the presented paper is based on primary and secondary sources. The theoretical part was created by a detailed examination of the environment of secondary sources; it was mainly the leading scientific databases that led us to the study of professional knowledge. We compared individual information from leading authors

of articles in the field of research and decided to interpret some professional articles by authors, published in scientific journals and professional studies from the proceedings of leading conferences. The data also come from various professional academic texts from practitioners. The primary source of the submitted paper is a questionnaire survey. The data collection through the questionnaire took place between the V4 countries, namely the Czech Republic, Hungary, Poland, Slovakia and the countries of Serbia and Bulgaria. The research group within the territory of the Slovak Republic consisted of 100 respondents. Business entities on behalf of the surveyed respondents had certain demographic elements. Respondents stated their gender at the beginning of the questionnaire, which was 53% (53 respondents) women and 46% (46 respondents) men. Another fact was the age, which reached the level of 18-30 years 22% (22 respondents), followed by the level 31-45 with a share of 30% (30 respondents). According to the following range of 46-60 years, the share structure was 32% (32 respondents). The overall picture of the age distribution completes the threshold of 61 and more was in the ratio distribution at the level of 16% (16 respondents). Respondents also showed varying degrees of education. The secondary school level was represented by 15% (15 respondents), followed by the first stage of university with a share of 11% (11 respondents), the second is the second stage of university with 71% (71 respondents) and the third stage of university was 3% (3 respondents). Business entities on behalf of respondents showed certain job positions they hold. Respondents mentioned an ordinary employee with a share of 18% (18 respondents), a manager with a share of 35% (35 respondents) and a senior manager with a share of 25% (25 respondents) and a business owner with a share of 22% (22 respondents). Respondents also stated the size of the company in terms of the number of employees. Individual data show a share of less than 9 employees 62% (62 respondents), followed by a range of values of 10 - 49 employees, where the range was 21% (21 respondents), then a range of 20 - 249 with a share of 8% (8 respondents) and finally more than 250 respondents with 9% (9 respondents). Another breakdown was in terms of the company's total assets, where under 2 million Euros were 73% (73 respondents), next in the range was from 2 to 10 million in 17% (17 respondents). The penultimate value is an interpretation of 10 million to 43 million in 4% (4 respondents) and the last value is 43 million 6% (6 respondents). Another metric speaks about the length of operation of a business entity where within two years the value of the share was 24% (24 respondents), from 3 to 5 years the value was 8% (8 respondents), then 6-10 years of operation the share was 21% (21 respondents). From 11 to 20 years 21% (21 respondents) and 21 years and older the share is 26% (26 respondents). Business entities were further segmented into industries where 42% (42 respondents) stated that the business entity is engaged in production. 18% (18 respondents) also deal with trade and 40% (40 respondents) represent services. 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 business activities, respondents mentioned agriculture 7% (7 respondents), followed by mining and quarrying with 8% (8

respondents), machinery and equipment with 8% (8 respondents), construction and developers with 14% (14 respondents), wholesale and retail with 16% (16 respondents), and information and communication with 26% (26 respondents). On the other hand, respondents also mentioned production with 9% (9 respondents), finance and insurance with 4% (4 respondents) and Industry, including energy with 2% (2 respondents), and other sectors with 6% (6 respondents). The research set of other compared business entities in countries other than Slovakia was represented by Hungary with 110 respondents, the Czech Republic with 87 respondents, Poland with 101 respondents, Bulgaria with 101 respondents and Serbia with a frequency of 134. The software used to process the data was SPSS 22

To determine the significance between the size of companies in terms of number of employees and knowledge of Industry 4.0 elements, we used Cramér's V statistical method is used to determine the relationship between nominal and ordinal variables.

$$\phi_c = \sqrt{\frac{\chi^2}{N(k-1)}} \quad (1)$$

N = the sample size involved in the test,

ϕc = denotes Cramér's V,

χ^2 = Pearson chi-square statistic from the aforementioned test,

k = lesser number of categories of either variable.

Measured awareness variables have a result in the form of a Likert scale defined as an ordinal variable with values marked as 1 - I have never heard of it; 2 – heard of it, but I never used it; 3 - heard and I plan to use it; 4 - I hear and use it occasionally; 5 - I have heard and used it in my normal business operations.

4. RESULTS

Given the stated goal and hypotheses, it is important to define awareness of the phenomenon of Industry 4.0. Hypothesis No. 1 was confirmed, because the majority of business entities in Slovakia are aware of the issue of Industry 4.0. The following table defines the number of business entities on behalf of the respondents who marked the answer "yes" as 61 (61%) and the answer "no" as 39 (39%). Based on the above results, we can conclude that most of the respondent Slovak businesses are aware of the existence of the phenomenon of Industry 4.0, but further increasing awareness at the level of small and medium-sized Slovak businesses in the form of education is desirable.

On the other hand, to clarify hypothesis no. 2, it was necessary to compare the results obtained from business entities, with respect to the geographical location. To compare the individual results between Slovakia and other V4 countries, Serbia and Bulgaria, more than half of the business entities are aware of Industry 4.0. These results confirm the pre-defined hypothesis 2, which states that the awareness of Industry 4.0 in the comparison of Slovakia with other V4 countries, Serbia and Bulgaria, has more than half of the surveyed business entities. The following Figure 1 relates to the evaluation of the questionnaire survey according to the methodological design of the submitted paper with the topic of examining awareness of Industry 4.0 in the environment of the surveyed countries.

With regard to the individual countries

Table 1. Are you familiar with the term INDUSTRY 4.0

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	61	61.0	61.0	61.0
	No	39	39.0	39.0	100.0
	Total	100	100.0	100.0	

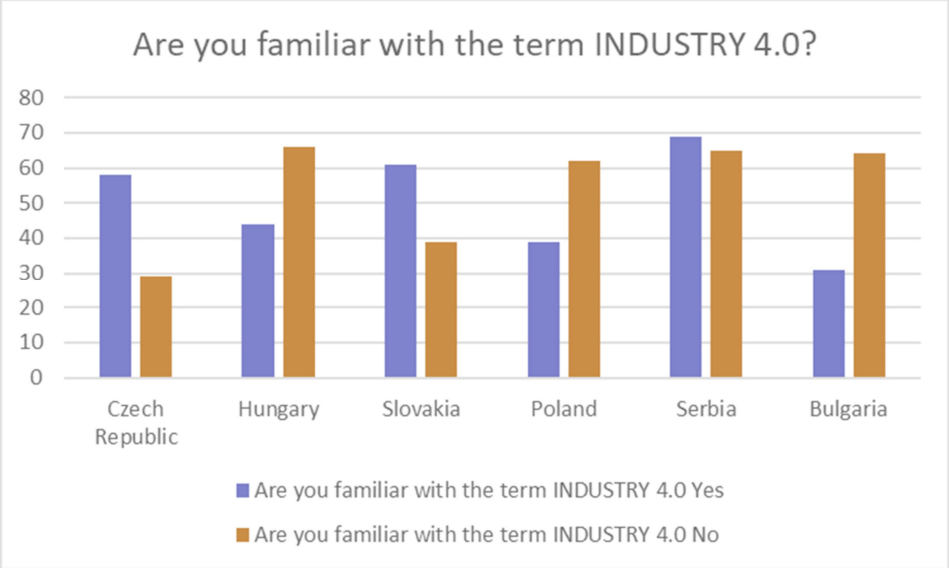

Figure 1. Are you familiar with the term INDUSTRY 4.0. - Yes/No

surveyed, the Czech Republic has an incidence of 58 for the answer “yes” and 29 for the answer “no” out of the total size set of 87 respondents. From the partial results after the analysis, we can define the conclusion in the form of the statement that in the vast majority of respondents in the Czech Republic, the term Industry 4.0 is known. It is followed by Hungary with 44 for option "yes" and for the answer "no" there are 66 represented units from the total examined group. The total number of respondents from the data set from the specified country is 110. In conclusion, we can say that for most Hungarian respondents on behalf of business entities, the term Industry 4.0 is not known. Poland achieved a frequency of 39 for the answer "yes" and a frequency of 62 for the answer "no". The total number of respondents from this country is 101. We can say that the concept of Industry 4.0 in Poland is, to a large extent, not known. For the country of Serbia, the result for option “yes” is 69 and for option “no” is 65 out of 134 respondents. In conclusion, we can state that the concept of Industry 4.0 is mostly known in the territory of Serbia. For Bulgaria, option “yes” is 31 and “no” is 64. The total number of Bulgarian businesses for this question was 95. We can say that for respondents from the data set in Bulgaria, the term Industry 4.0 is not sufficiently known.

The results of the frequency analysis of the examined variable aimed to answer the question whether there is a significant relationship between the size of companies

Table 2. "The country in which your company operates" and "Are you familiar with the term INDUSTRY 4.0

		Are you familiar with the term INDUSTRY 4.0		Total
		Yes	No	
The country in which your company operates	Czech Republic	58	29	87
	Hungary	44	66	110
	Slovakia	61	39	100
	Poland	39	62	101
	Serbia	69	65	134
	Bulgaria	31	64	95
Total		302	325	627

Table 3. Relationship analysis by Cramer's V

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Nominal by Nominal	Phi	,161			,001
	Cramer's V	,161			,001
	Contingency Coefficient	,159			.001
Ordinal by Ordinal	Kendall's tau-b	-.132	.036	-3.646	.000
	Kendall's tau-c	-.159	.044	-3.646	.000
	Gamma	-.218	.059	-3.646	.000
	Spearman Correlation	-.144	.039	-3.633	.000[c]
Interval by Interval	Pearson's R	-.141	.040	-3.551	.000[c]
N of Valid Cases		627			

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

in terms of number of employees and awareness of Industry 4.0 in Slovakia and other V4 countries, Serbia and Bulgaria. From the results, which are presented in the following table, we can confirm that there is a significant relationship between the nominal variable "Industry 4.0 awareness of Slovakia and other V4 countries, Serbia and Bulgaria" and the ordinal variable "number of employees". The hypothesis is confirmed by verification by Cramer's V p = 0.161 and Sig = 0.001 (Sig <0.05).

Table 4 is devoted to the interpretation of the findings from the questionnaire survey, which verifies the hypothesis that more than half of the business entities on behalf of respondents in the V4 countries, Serbia and Bulgaria are familiar with Industry 4.0 tools. The following conclusions can be drawn from the analysis. We note that a defined ordinal variable with Likert scale values marked as 1 - I have never heard of it; 2 – heard of it, but I never used it; 3 - heard of it and I plan to use it; 4 - I have heard of it and use it occasionally; 5 - I have heard of it and use it in normal business operations, they talk about a certain concretization of the results in the area of value 3, where a certain awareness is created about the tool, which can be reflected in its use on a practical level. Based on the above results, we can conclude that the results vary from country to country. For the Czech Republic, the defined average value is the same for 3D printing and

Table 4. Comparison of countries and awareness of Industry 4.0 tools

The country in which your company operates		Familiar with Cloud computing services	Familiar with Big data analysis	Familiar with 3D printing and robotics	Familiar with Internet of Things	Familiar with Virtual reality	Familiar with Augmented reality	Familiar with Supply chain management	Familiar with Artificial intelligence
Czech Republic	N Valid	84	85	85	85	85	84	84	85
	Missing	5	4	4	4	4	5	5	4
	Mean	2.7143	2.8000	2.8824	2.5765	2.6000	2.3214	2.6786	2.6941
	Median	2.0000	3.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
	Mode	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Hungary	N Valid	110	110	110	110	110	110	110	110
	Missing	0	0	0	0	0	0	0	0
	Mean	3.4455	2.0727	2.3818	2.2182	2.3455	2.0636	2.1273	2.3273
	Median	4.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
	Mode	5.00	1.00	2.00	1.00	2.00	2.00	1.00	2.00
Slovakia	N Valid	100	100	100	100	100	100	100	100
	Missing	0	0	0	0	0	0	0	0
	Mean	3.3400	2.9000	2.8100	2.8500	2.7300	2.5300	2.8600	2.8300
	Median	4.0000	3.0000	3.0000	3.0000	3.0000	2.0000	3.0000	3.0000
	Mode	4.00	3.00	2.00	2.00	2.00	2.00	3.00	2.00
Poland	N Valid	101	101	101	101	101	101	101	101
	Missing	0	0	0	0	0	0	0	0
	Mean	2.4356	2.0297	2.5446	2.2079	2.4158	2.0198	2.6337	2.6436
	Median	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
	Mode	2.00	1.00	2.00	1.00	2.00	1.00[a]	2.00	2.00
Serbia	N Valid	134	134	134	134	134	134	134	134
	Missing	0	0	0	0	0	0	0	0
	Mean	3.3881	2.9478	2.9030	2.8657	2.9179	2.6791	2.9851	2.9552
	Median	3.5000	3.0000	3.0000	3.0000	3.0000	2.5000	3.0000	3.0000
	Mode	5.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Bulgaria	N Valid	100	101	100	95	98	98	101	101
	Missing	1	0	1	6	3	3	0	0
	Mean	2.3900	1.8218	1.6700	2.3158	1.8469	1.8163	2.2277	1.8911
	Median	2.0000	1.0000	1.0000	2.0000	1.0000	1.0000	2.0000	1.0000
	Mode	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

a. Multiple modes exist. The smallest value is shown

robotics tools, followed by Big Data and Cloud Computing Services (CCS). On the contrary, the lowest average ratings for the Czech Republic were achieved by Augmented Reality (AR), Internet of Things (IoT) and also Virtual Reality (VR). For respondents from Hungary, we observe the highest value for the CCS tool, followed by the 3D printing and robotics tool, similar to the previous surveyed country (Czech Republic). For Slovakia, it is by far the most numerous value for the CCS tool and, similarly to the previous researched country, the 3D printing and robotics tool follows. The lowest evaluation obtained in the Slovak Republic was given to the tools of the AR and the CoR, in which certain logical connections can be sought. Poland and the involved business entities represented on behalf of the respondents, the area of AI was stated in the highest average value and the area of AR was placed in the lowest representation. Serbia and Bulgaria have the same highest average scores for tools in the field of Cloud computing services, which is a rating that is typical for most of the surveyed

areas. The lowest scores among all the examined instruments were reported by business entities operating in the territory of Serbia for the AR instrument. Based on the results of the survey for Bulgaria, we can quantify as a tool with the lowest number of points 3D printing and robotization. In the end, we observe differences in the Czech Republic and Poland, where 3D printing and robotics dominate, and in other countries Cloud computing services dominate.

The following Table 5 confirms the hypothesis that business entities are most familiar with the big data element in the Industry 4.0 environment. The highest average of all the listed Industry 4.0 tools was recorded in the Cloud computing services response. The most common answer 3 "I have heard of it and I plan to use it" - occurred just at Cloud computing services. We did not confirm the hypothesis, but we found that the subjects are most familiar with the element of Cloud computing services from Industry 4.0 tools.

The following Table 6 verifies the hypothesis that there is a significant relationship between the ordinal variable "V4 countries, Serbia and Bulgaria" and the nominal variable "Industry 4.0 awareness". We verified this statement by Cramer's V p = 0.236 and Sig = 0.000 (Sig <0.05). We confirm the hypothesis, as there is a significant relationship between the countries studied and the awareness of Industry 4.0.

The following lines are devoted to the discussion and conclusions that result from the analysis of the theoretical background and practical outputs in the form of analysis of the questionnaire solution.

5. DISCUSSION AND CONCLUSION

The stated goal of the paper, to examine awareness of Industry 4.0 and its tools across the V4 countries, Serbia and Bulgaria, has been met. By interpreting scientific articles and various professional publications of several experts from the theoretical as well as practical area of the researched issue, we pointed out important milestones in the context of Industry 4.0 and tools (Doležal, 2017) that can increase awareness of the researched issues. The mentioned methodology of the contribution can be used

Table 5. Individual values achieved on the Likert scale for individual Industry 4.0 tools

		Familiar with Cloud computing services	Familiar with Big data analysis	Familiar with 3D printing and robotics	Familiar with Internet of Things	Familiar with Virtual reality	Familiar with Augmented reality	Familiar with Supply chain management	Familiar with Artificial intelligence
N	Valid	629	631	630	625	628	627	630	631
	Missing	6	4	5	10	7	8	5	4
Mean		2.9889	2.4406	2.5413	2.5200	2.4968	2.2584	2.5968	2.5705
Median		3.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
Mode		2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Std. Deviation		1.44590	1.28206	1.22015	1.33733	1.15677	1.14321	1.24028	1.20225
Minimum		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Maximum		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Percentiles	25	2.0000	1.0000	2.0000	1.0000	2.0000	1.0000	2.0000	2.0000
	50	3.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
	75	4.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000

Table 6. Relationship between the variables "V4 countries, Serbia and Bulgaria" and "Industry 4.0 awareness"

		Value	Asymp. Error[a]	Std.	Approx. T[b]	Approx. Sig.
Nominal by Nominal	Phi	.236				.000
	Cramer's V	.236				.000
	Contingency Coefficient	.230				.000
Interval by Interval	Pearson's R	.131	.039		3.304	.001[c]
Ordinal by Ordinal	Spearman Correlation	.130	.039		3.266	.001[c]
N of Valid Cases		627				

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

in a wide range across the surveyed V4 countries, Serbia and Bulgaria. From the conclusions of the questionnaire survey, it is clear that the majority of business entities in Slovakia are aware of the issues of Industry 4.0 and its basic tools. Through the results of the questionnaire survey, we pointed to the findings on the awareness of the concept of Industry 4.0 in the surveyed countries, which yielded similar results visible in the Czech Republic, Slovakia and Serbia, and on the other hand similar results in Poland, Hungary and Bulgaria which support the creation of diversified educational models that could be suitable for individual groups of business entities within the surveyed countries.

Based on the interpreted findings aimed at examining awareness of Industry 4.0 tools, we are of the opinion that several respondents have knowledge of Industry 4.0 tools, but have not yet applied them in the course of their businesses. The analysis of the answers of the responded business entities points to the innovative potential of bringing Industry 4.0 tools into practice. The prediction not only includes the need for education to increase awareness of Industry 4.0 tools, but at the same time it is necessary to increase motivation for the implementation of specific tools, as a result of which business results should improve. We are also considering new inventions that should be placed in the advancement of systems for the easy implementation of Industry 4.0 tools in businesses, especially through software applications as a driving force for Industry 4.0. In the identified significance between the size of companies in terms of number of employees and awareness of Industry 4.0 tools, we point to the relationship between the two variables. We think that for further research, it would be appropriate to focus on the relationship between business size and awareness, as we have found that micro and small businesses have less awareness, while medium and large businesses have more awareness. By researching medium and large companies, we can come to certain specifics and factors that are characteristic of this environment and then use them for the benefit of smaller and micro businesses. In conclusion, the level of awareness of Industry 4.0 is one of the areas that have not yet been sufficiently explored, and it is therefore necessary to plan and implement follow-up research activities in this area.

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СВЕСТ О ИНДУСТРИЈИ 4.0 И ЊЕНИМ АЛАТИМА ШИРОМ В4 ЗЕМАЉА, СРБИЈЕ И БУГАРСКЕ

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Извод

Истражене земаље, које укључује земље В4, Србију и Бугарску, раде на томе да искористе потенцијал који дигитализација нуди у оквиру концепта Индустрије 4.0. Успон индустрије 4.0 резултирао је алатима као што су машинско учење, велики подаци, аутоматизација и роботика. У садашњем окружењу то примећујемо у скоро свим привредним субјектима и широм земаља В4, Србије и Бугарске. Свест о Индустрији 4.0 наставља да расте у тренутном окружењу, управо као резултат експанзије Индустрије 4.0. Проучене земље подижу алате Индустрије 4.0 на нови ниво. За добијање ажурне слике о истраживаној проблематици коришћен је сопствени анкетни упитник којим је испитан и анализиран тренутни ниво Индустрије 4.0, а резултати садржани у овом раду могу се упоредити са резултатима истраживања тренутног нивоа Индустрије 4.0 у другим земљама. У циљу добијања објективних резултата анкетног упитника, дефинисано је пет области истраживања коришћењем пет хипотеза. Основна корист рада лежи у интерпретацији резултата научних истраживања аутора, који указују на тренутни ниво и стопу коришћења алата Индустрије 4.0 у дефинисаним областима.

Кључне речи: велики подаци, рачунарство у облаку, дигитализација, ИоТ (Интернет свари), Индустрија 4.0, алати Индустрије 4.0, онлајн маркетинг

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