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Original Scientific Paper

THE IMPORTANCE OF KNOWLEDGE BREADTH IN THE DIGITALIZATION PROCESS OF SOCIAL ENTREPRENEURSHIP

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Abstract. *One of the ways to solve economic and social problems is social entrepreneurship. In today's turbulent environment, the question of survival is posed to all economic entities, including those who operate as entities of social entrepreneurship. Digitization of business is a necessary process in innovating business models. In this research, we observed the impact of the knowledge breadth on the process of digitalization of the business of social entrepreneurship entities. In order to measure the knowledge breadth, we used the plans according to which the education in the field of digitization is carried out, the number of certified and expert lecturers, the number of sources of knowledge, patents and creativity. The main goal of the research is to determine whether the knowledge breadth can contribute to accelerating the process of digitization of social entrepreneurship and thereby contribute to its development. 97 social entrepreneurship entities from Bosnia and Herzegovina (B&H) participated in the research. Data were collected using questionnaires and analyzed using correlation and regression methods. We investigated the importance of the knowledge breadth in the process of digitization of social entrepreneurship. According to the results of the research, the knowledge breadth significantly affects the application of digitization in social entrepreneurship entities.*

Key words: *social entrepreneurship, knowledge breadth, digitalization, economic and social development*

JEL Classification: O10, O33, O35

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1. INTRODUCTION

Freedom of competition contributes to the development of the entrepreneur as an individual, and thus the economy, because according to Schumpeter's theory, the growth of the number of entrepreneurs leads to economic growth (Bazhal, 2016). If everything worked as in theory, there would be no poverty, and we are aware of the fact that this is a big problem today. We are also aware of the fact that people who have some physical disability or other health problem cannot live normally due to lack of understanding of the environment and poor employment opportunities. All over the world, numerous governmental and non-governmental organizations and associations are struggling with these problems, in order to provide this part of the community with a decent life and open employment opportunities. One of the possibilities that perhaps offers the best and highest quality solution is the development of social entrepreneurship. The measures adopted by the states are mostly short-term and insufficient to have a long-term effect on suppressing the negative consequences of these problems. Therefore, it is very important to find some alternative ways to influence the reduction of social inequality and increase the inclusion of marginalized groups of society in all economic and social flows of the community. Social entrepreneurship is a great way to solve these problems. This research is focused on the analysis of the connection and relationship between the digitization process and the development of social entrepreneurship. The development of technology requires the development of innovative business models in all areas of business, including social entrepreneurship. Dees (1998) observes social entrepreneurship as a phenomenon that shows potential for solving accumulated social problems, for addressing unmet needs and innovative ways of connecting and using existing resources. The development of ideas, expansion of knowledge and innovation are something business entities cannot survive without in the current turbulent business environment. The crisis caused by the pandemic of the COVID-19 virus is the best indicator of the importance of digitization, ideas, innovations and knowledge. Business entities that were ready to respond to this challenge survived even in these difficult times. Therefore, advanced digital technology, that is, "artificial intelligence (AI), Internet of things, Big Data, social networks, Cloud, computing, robotics, 3D printers, autonomous vehicles, virtual reality, machine learning, are no longer in the domain of mega trends of the future, but have become a reality in the XXI century" (Petković, 2021, p. 56).

Like all business entities, social entrepreneurs also face increasing competition on the market, and that is why innovations are very important in this area as well. Innovating business models of social entrepreneurship is the only way to survive in this environment. This fact is supported by empirical research and authors who dealt with this issue (Seelos & Mair, 2005; Müller, 2012; Wulleman & Hudson, 2015). Ludbrook et al. (2019) and Barbieri & Santos (2020) talk about the importance of business models and their constant innovation. Social entrepreneurship reduces unemployment, includes marginalized social groups in economic activities, helps solve health, educational and other social problems, fights against climate change and pollution of nature. In order to speed up the digitization process, it is necessary to provide adequate training for employees that will enable IT literacy. It is necessary to ensure the expansion of the knowledge of both employees and managers. State institutions must necessarily be involved in encouraging this process. It is necessary to organize seminars, workshops, to develop programs that will bring the digitization process and its significance closer to the business and social community. Digitization is not a "spook", but a necessity in order for anyone to function and survive

today. Thanks to digitalization and advanced technologies, the whole world is now "at your fingertips", so no one should run away from this process, but adapt in the best possible way.

The connection between digitization and social entrepreneurship appears as a way to overcome numerous economic and social problems. In this paper, we will observe the influence of the knowledge breadth on the process of digitization of social entrepreneurship. We will declare other factors as constants (ceteris paribus). Based on this, we defined the research problem with the following question: How can the knowledge breadth contribute to improving the digitalization of social entrepreneurship?

Based on the problem we have defined, we can also determine the subject of our research. The subject of the research is a theoretical-empirical analysis of the knowledge breadth and its influence on the process of digitization of social entrepreneurship with special reference to B&H. We will locate the research subject in the field of entrepreneurial and theoretical economics. We will declare the influence of other variables as constants in this research. The geographical area of research in this paper is the territory of B&H.

The theoretical part of the analysis refers to the review of relevant literature in the field of digitalization and social entrepreneurship, as well as the impact of the digitalization process on the development and innovation of social entrepreneurship. The empirical analysis is based on the examination of social entrepreneurship entities. The research was conducted in the form of a survey with a structured questionnaire.

We believe that this research will be useful to institutions that should support the development and implementation of digitization in all business sectors, as well as to institutions that should support the development of social entrepreneurship. This research will be useful to the SME sector and entrepreneurship in order to introduce advanced technologies in their business and complete the digitization process in the fastest and easiest way. Also, this research should awaken the awareness of existing small and medium-sized enterprises and entrepreneurs to the importance of solving some social problems and that in this way both economic and social goals can be achieved. We believe that the public is not sufficiently familiar with both the digitalization process and the concept and significance of social entrepreneurship, and that this research will raise awareness and encourage anyone who has an idea and thinking about starting a business to focus on this way of business.

This paper consists of seven parts: an introduction, literature research, developed hypothesis, methods, research results, discussion and conclusion.

2. LITERATURE REVIEW

Social entrepreneurship. According to the classic definition, entrepreneurship represents a set of human activities to combine resources in order to achieve a certain business venture (Vukmirović, 2006). In recent years, there are more and more economic opinions according to which entrepreneurship is considered the fourth factor of production, next to labor, capital and technologies (Wadhwani et al., 2020). When we add the achievement of some social goal to these definitions, we arrive at the concept of social entrepreneurship. The first social enterprises in Europe were formed in Italy and were called social cooperatives. Based on this example, social entrepreneurship is starting to develop in other European countries as well. This has the consequence that today there are around 40 million employees and 200 million volunteers working in the social entrepreneurship sector in the world (Banjac & Dojčinović,

2016, p. 43). In the 19th century, cooperatives played a leading role in the social economy sector, and were one of the oldest and most widespread forms of social enterprises (Volkmann et al., 2012, p. 10). "The importance of social entrepreneurship in a certain society is inversely proportional to the level of development. That is, if society is less developed, the importance of social entrepreneurship is greater" (Petković, 2021, p. 106). Social entrepreneurship represents "business ventures that, in addition to generating profit for the owners, also have some (higher) social or ecological purpose" (Martin & Osberg, 2007, p. 34). "Social enterprises are enterprises that operate on the market for social and ecological reasons. Although they primarily strive to achieve social and ecological goals, social enterprises should behave like companies from the private profit sector and should achieve both financial and commercial goals" (Ridley-Duff & Bull, 2011, p. 114). According to Guerrero et al. (2020), the ecosystem of social entrepreneurship includes non-linear dynamics, focusing on creativity, vision, dedication and the ability of individual entrepreneurs to recombine resources to create new products and initiate market processes that are far from equilibrium and create a market order.

Digitalization. According to Brennen & Kreiss (2016), digitization in the broadest sense represents the translation of an analog signal into digital form. It changes companies by influencing changes in their organizational structures, management strategies and relationships with customers and other companies (De Groen et al., 2017). Successful companies systematically prepare for digital transformation instead of reacting to it situationally (Burilović, 2020). Digitization has a particularly strong impact on small businesses that, due to financial and other reasons, are slow to adapt to new market conditions (Bollweg et al., 2018). Each enterprise should identify its capabilities and the ways in which the digital transformation will be carried out (Hagel et al., 2015). Digitization in business refers to enabling, improving and transforming business operations, functions, models, processes and activities using digital technologies and digitized data (Legner et al., 2017). Even after the digitization process is completed, it is necessary to continue to live with changes and constantly find new business solutions (Schallmo & Daniel, 2018).

Knowledge breadth. Knowledge is information and skills that human beings acquire through their mental abilities (Chazette et al., 2021, p. 197). Knowledge is acquired through the ability of human beings to recognize, observe and analyze the facts and information that surround them. Based on knowledge, skills and abilities are developed (Kazemi & Allahyari, 2010, p. 873). According to Alavi & Leidner (2001, p. 115), knowledge is confirmed information. "Most scientists consider that the accumulation of individual information, skills, abilities, experiences and understanding in coded and decoded forms is the simplest description of knowledge" (Saleh et al., 2018, p. 388). In order to create ideas and develop innovations, it is necessary to continuously expand knowledge. Innovation requires broad knowledge and it is characterized by great ingenuity and creativity. Ferreras-Méndez et al. (2015, p. 87) define knowledge breadth "as the number of knowledge sources or search channels that firms rely on to improve their knowledge base". According to Jin et al. (2019, p. 733), "for example, companies can acquire technological knowledge, market knowledge and/or knowledge in other fields. This can be characterized as knowledge breadth ". According to Hwang et al. (2014, p. 4) knowledge breadth "refers to how much knowledge individuals have about different domains". Knowledge breadth represents the diversity of knowledge, knowledge and experiences of an individual, that is, the number of different domains within his or her knowledge. Individuals with broad knowledge have greater exposure to diverse perspectives that increase their ability to recombine knowledge (Mannucci & Yong, 2018, p. 1744). According to Damanpour & Aravind (2012), knowledge

is a much more important resource than the financial power of organizations. Nagano (2019) observes knowledge as an organizational resource and that it has completely different characteristics compared to other resources. It can be used countless times without being used up and it will not be reduced by exchange, on the contrary, it will be increased.

3. HYPOTHESIS DEVELOPMENT

In order to measure knowledge breadth, we will use the plans according to which the education in the field of digitization is carried out, the number of certified and expert lecturers, the number of sources of knowledge, the number of patents and individual creativity. Del-Corte-Lora et al. (2016) used regression analysis to determine the impact of knowledge breadth on innovation. They used different sources of knowledge as measures. Farazi et al. (2019) used discovered technological advantage (patents, licenses, innovations) to measure knowledge breadth in their research. Lodh & Battaggion (2015) used patents and creativity as measures of knowledge breadth in their research. Moorthy & Polley (2010) also used patents as a measure of knowledge breadth in their research. Modern and high-quality educational plans of companies and cooperation with educational institutions are emerging as key factors in the successful implementation of digital transformation in numerous sectors (Day et al., 2019). Altınay & Altınay (2018) proved that the development of technology and digitization develop skills and provide a chance for women social entrepreneurs who create projects to encourage social responsibility for knowledge exchange, research and learning. According to Xu (2015, p. 610), "the knowledge breadth has a direct impact on innovation". Symeonidou et al. (2022) identified knowledge breadth as an important factor affecting income growth, as well as a factor in the development of functional entrepreneurial abilities. Leiponen (2005, p. 305) explores knowledge as one of the key factors in improving market performance and believes that "companies that initially possess high skills can feel that investments in research and development are more productive, which enables superior results". Certain authors have proven in their research that the knowledge breadth is very important for innovation and technological progress of both organizations and entrepreneurs (Leiponen & Helfat, 2010; Zhang, 2016; Radicic, 2020). Ratten (2018) showed that digitization has a positive impact on the development of social entrepreneurship. The development of the Internet and social networks has enabled easier and faster communication and exchange of information. Digitization can be used to modernize individual business operations of entrepreneurs or corporations (Van Welsum, 2016). The great advantages of digitalization are easier and faster communication and understanding of customer needs and wishes, as well as simpler monitoring of the success of marketing moves (Kergroach, 2020). Digitization enables faster feedback from customers and therefore faster transformation of products according to the customer (Thrassou et al., 2020). Digitization of business makes it easier to direct activities to the target group of customers (Garzoni et al., 2020). Many micro and small enterprises have become multinational giants with the help of digital innovations, such as Microsoft, Google, Apple, Samsung and other entrepreneurial growing companies (Petković, 2021, pp. 345-348).

Based on this, we will define the research hypothesis (H): *Expanding the knowledge of employees in the field of application of digitization will contribute to the development of social entrepreneurship*.

4. METHODS

For the purpose of testing the hypothesis, we used a combined empirical research - theoretical and quantitative research. To be able to determine the significance of the knowledge breadth in the digitization process that will contribute to the development of social entrepreneurship, we collected, processed, analyzed and interpreted secondary and primary data. As part of the theoretical research, we used domestic and foreign literature. This part of the research gave us an insight into the current state of the research problem and enabled us to analyze the results of recent research in this area and to discuss and compare them with the results of empirical research conducted for the purposes of testing the research hypothesis and seeking answers to the research problem.

The methods we used in this research for data processing and analysis enabled us to determine the impact of knowledge breadth on digitalization of social entrepreneurship. We will observe knowledge breadth as an independent variable, and the digital transformation of social entrepreneurship as a dependent one. The influence of other variables in this research will be declared as constants (ceteris paribus). For the purposes of this research, we used questionnaires. The questionnaire contains two parts. The first part of questionnaire refers to the general information about social entrepreneurship. Second part of the questionnaire refers to the knowledge breadth of respondents. The questionnaire was designed based on the 2016 ZEW (Leibniz Center For European Economic Research) research on digitalization of social entrepreneurship. The part of the questionnaire related to breadth of knowledge contains questions that include measures of breadth of knowledge as an independent variable (the plans according to which the education in the field of digitization is carried out, the number of certified and expert lecturers, the number of sources of knowledge, the number of patents and individual creativity). The answers to these questions were used as data that gave us a clear picture about the level of the respondent's breadth of knowledge in the field of digitization and whether it can influence the development of social entrepreneurship. In order to be able to compare the results of the analysis, we used the methods of comparison and classification, then the methods of analysis and synthesis.

For data processing, we used automatic data processing using the Google Drive application, which displays the data from the completed questionnaire tabularly and graphically in MS Excel.

We used quantitative methods to analyze and test hypotheses:

- Binomial distribution - probability distribution model (Sylla, 2014),

$$P(x) = \binom{n}{x} p^x q^{n-x}$$
$$x = 0, 1, 2, ..., n \qquad (1)$$
$$P(x) = 0 \text{ for all other } x.$$

- Chi square test (χ^2) - testing the significance between the frequency of distribution and the mutual connection of different characteristics (Lovrić et al., 2006),

$$\chi^2 = \sum_{i=1}^{r} \frac{(f_i - f_i^*)^2}{f_i^*} \qquad (2)$$

- Duncan test of variance analysis – analysis of the impact of one phenomenon to another (Duncan, 1955; Čobanović et al., 2003),

$$R_{(p,v,\alpha)} = \sigma_m \cdot r_{(p,v,\alpha)} \tag{3}$$

- Signum test – since the collected results had non-parametric characteristics that deviate from the expected binomial distributions, the Signum test was also used, which is also used for hypothesis testing (Stević et al., 2021; Stević et al., 2019).

The population in this paper consists of business entities and non-profit organizations on the territory of Bosnia and Herzegovina that are engaged in social entrepreneurship, that are solving a certain social problem by investing part of their profits. Selection of the sample was one of the biggest problems during the research. Namely, in B&H there is no official record of social entrepreneurship subjects from which we could get contacts. We managed in various ways. We got 122 email addresses from different sources (from associations dealing with the gathering of social entrepreneurs, from the CDP Globus-center which gathers social entrepreneurs in B&H, from various social entrepreneurship conferences from B&H) and sent them the questionnaire electronically. We formed the sample of 97 participants. This sample refers to those respondents who returned the completed questionnaire to us. We sent the questionnaires to the addresses of the managers of social entrepreneurship entities or to the official email addresses of the entities with a note that the questionnaires should be filled out by their managers. We believe that managers of social entrepreneurship entities have the best data on the breadth of knowledge in their organizations, as well as on the development of social entrepreneurship. Therefore, we believe that the managers of the social entrepreneurship entities have filled out the questionnaires. Based on the application of these methods and the obtained results, in this research we proved that the knowledge breadth has a significant impact on accelerating the process of digitization of social entrepreneurship entities. The presented results can contribute to improving the development of social entrepreneurship as a factor in the economy and society development. At the end, we compared the obtained results with the results of similar research and looked at the possibilities of their application in B&H and other small open economies in development.

5. Research Results and Testing of Hypothesis

Our research covered the whole of Bosnia and Herzegovina. The distribution of the years of establishment of social entrepreneurship entities is not even due to three companies from the 60s of the last century, the median year of establishment is 2006.68. Therefore, we see that the median year of establishment is not far away and that these are relatively "young" social entrepreneurship entities (Figure 1).

Most of the social enterprise entities that participated in the research were registered as citizens' associations (28.9%), followed by limited liability companies (23.7%), followed by independent entrepreneurs (18.6%). 12.4% of organizations are registered as non-governmental organizations, 8.2% of organizations are registered as cooperatives and 4.1% of organizations are registered as foundations.

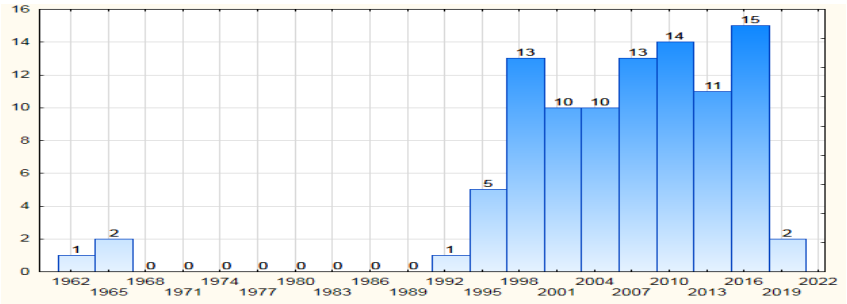

Fig. 1 Year of establishment of social entrepreneurship entities
Source: The creator of the figure is the author (prim. aut.)

The results of the research show that the social entrepreneurship entities in the B&H are engaged in various activities. 25.8% of respondents are engaged in agriculture, which is the most represented activity in the sample. In second place is the store with a 22.7% share in the total sample. In third place is the provision of psychological and health services with 9.3% participation. This is followed by tourism, education and the food industry with a 7.2% share each. There are also: ecology with 5.2%, hospitality with 3.1% and finance with 2.1% participation.

The number of employees per organization is approximately exponentially distributed and it is determined by great inequality. The largest, dominant group consists of companies with up to 10 employees (81), and the average number of employees is 10,092. Therefore, the survey mostly covered micro-enterprises (Figure 2).

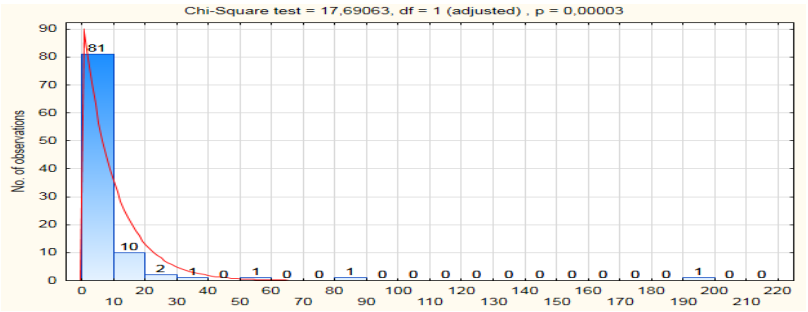

Fig. 2 Histogram of the distribution of the number of employees by organization
Source: The creator of the figure is the author (prim. aut.)

When we talk about the level of education of employees by organization, 54 organizations declared that they have from 1 to 4 employees with a university degree, 15 organizations declared that they have from 5 to 9 employees with a university degree, while 8 organizations declared that have 10 or more employees with a university degree. Most organizations (55) declared that they have from 1 to 4 employees with a high school education. 11 organizations declared that they employ up to 5 workers with higher vocational education, while 3 organizations declared that they employ from 5 to 10 workers with higher vocational education. 13 organizations declared that they have from 5 to 9 employees with high school

education, then 3 organizations declared that they have from 10 to 19 employees with high school education, while 6 organizations declared that they have 20 or more employees with high school education. 9 organizations employ up to 10 qualified workers. 13 organizations employ up to 4 unskilled workers, while one organization declared that it employs up to 30 unskilled workers seasonally.

The average lifespan of workers is normally distributed, with a mean age of 40.104 years, with a standard deviation of 6.49 years (χ^2=11,36219, df=7, p=0,12358). This distribution is shown in Figure 3.

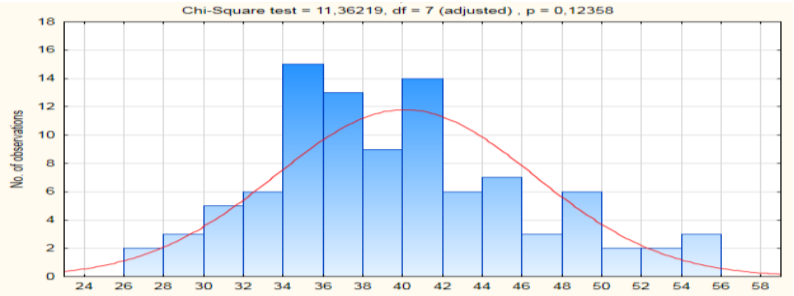

Fig. 3 Histogram of the distribution of the lifespan of workers
Source: The creator of the figure is the author (prim. aut.)

Table 1 shows the answers to the question "Which social problems does your organization deal with?". It was possible to give several answers at the same time. From the analyzed answers, we can conclude that the most frequent problem, which organizations deal with, is the inclusion of marginalized groups of society in economic flows. Next, there is the education of marginalized groups of society through various educations, seminars and trainings, as well as health care and other problems that the respondents try to solve through their activities.

Table 1 Social problems by subjects of social entrepreneurship

No.	Solving social problems	Number of answers
1.	Inclusion of marginalized groups of society in economic flows	83
2.	Education of marginalized groupsof society	36
3.	Health Care	23
4.	Ecological problems	11
5.	Others	5

Source: The creator of the table is the author (prim. aut.)

The distribution of the answers to the question "In the last three years (from 2018 to 2021) my organization has placed a new product or service on the market" is a binomial distribution with exclusive answers ((0) No and (1) Yes), with parameter of mean value of p=0.6185, analogue to the prevalence of positive responses (61.85%) (Figure 4). In the figure, we can see that 60 respondents have placed a new product or service on the market in the period of the previous three years.

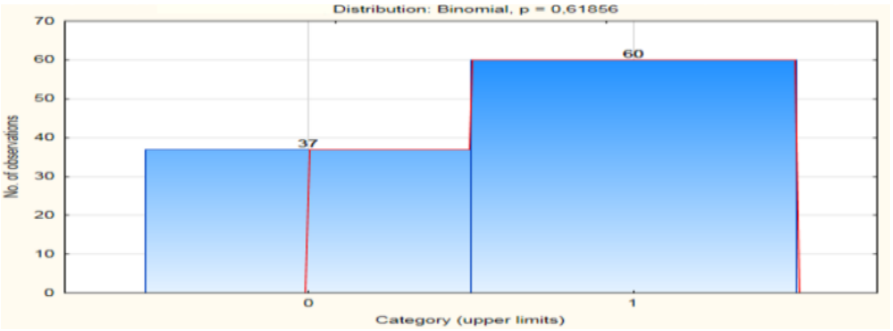

Fig. 4 Histogram of elementary binomial distribution of new product or service launch
Source: The creator of the figure is the author (prim. aut.)

Distribution of answers to the question "In the last three years (from 2018 to 2021), my organization has introduced some innovation in the way of producing products or providing services" with the following answers ((0) completely disagree, (1) disagree, (2) agree, (3) completely agree) was verified (p=0.1789>0.05) by binomial distribution with parameter p=0.7345 (χ^2=1.80632, df=1) (Figure 5). The mathematical expectation of responses of 1.9381 and standard deviation of 0.9980 with mode 2 (group of 40 respondents) was realized. This distribution of responses highlights two homogeneous groups in which the primary commitment (positive or negative) is clear, but the gradation of these commitments is not complete. The answers are moderately eccentric:

- Answers of respondents 13 and 12 respectively, a total of 25/97=0.2578, which somewhat correspond to the negative answer from the question "In the last three years (from 2018 to 2021), my organization has placed a new product or service on the market" (37/97=0.3814).
- Answers of respondents, respectively 40 and 32, a total of 72/97=0.7422, which somewhat correspond to the positive answer from the question "In the last three years (from 2018 to 2021), my organization has placed a new product or service on the market" (60/97=0.6185).

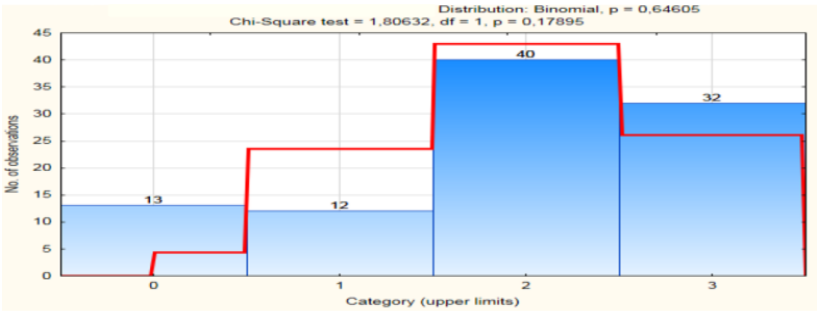

Fig. 5 Histogram of the significant binomial distribution of the introduction of innovation in the way of producing a product or providing a service
Source: The creator of the figure is the author (prim. aut.)

Here is the question about the difference between "new product" and "innovation" from the previous two questions. If we set the new product as an independent factor, the influence of this factor on innovation as a dependent variable, we confirm the agreement of the response (p=0.00011) by analysis of variance, i.e. all respondents, who answered positively or negatively to the first question related to "new product", significantly transferred the answer to "innovation", i.e. organizations that introduced a "new product" also introduced an "innovation".

To the question "We are satisfied with the level of development of social entrepreneurship in our economic environment" (with answers: (0) completely disagree, (1) dis agree, (2) agree, (3) completely agree), a crushing response is obtained, which is reflected in general dissatisfaction. As many as 95 out of 97 respondents (95/97=0.9793) of absolutely insignificant binomial distribution (eccentrically negative) gave answers from the negative domain, and only 2 respondents from the positive domain, where not a single respondent had absolute agreement with the question. The mathematical expectation of 0.4532 and the standard deviation of 0.5404 with mode (group of 56 respondents) were realized (Figure 6).

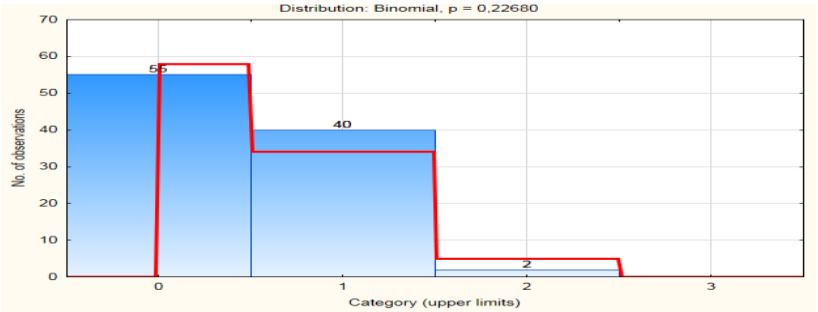

Fig. 6 Histogram of the significant binomial distribution of satisfaction of the level of social entrepreneurship development
Source: The creator of the figure is the author (prim. aut.)

According to the answers to this question, we see that the respondents are dissatisfied with the level of development of social entrepreneurship.

Digitalization. The distribution of answers to the descriptive question "We most often use computers for (with the possibility of choosing several answers at the same time)", is marked by the dominance of answers: processing text, issuing invoices and interacting with clients via social networks and websites.

The distribution of answers to the question "In business we use smartphones every day" (with the following answers: (0) completely disagree, (1) dis agree, (2) agree, (3) completely agree) was verified by a highly significant (p≈1) binomial distribution with parameter p=0.9037. The mathematical expectation of 2.7113 and the standard deviation of 0.5943 with mode 3 (group of 74 respondents) were realized (Figure 7).

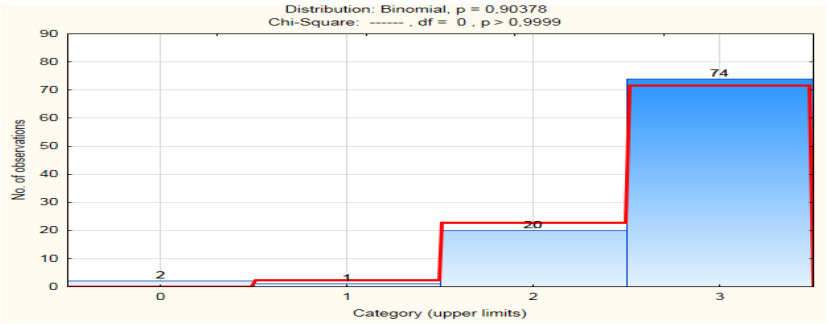

Fig. 7 Histogram of the significant binomial distribution of smartphone use
Source: The creator of the figure is the author (prim. aut.)

The distribution of answers to the question "We currently use advanced software, computer programs in our business" gave devastating results, with only 2 out of 97 respondents stating the use of advanced software!

The distribution of answers to the question "The current structure of employees is a big problem in the process of digitalization of business" (with the following answers: (0) completely disagree, (1) dis agree, (2) agree, (3) completely agree) was verified by significant (χ^2=1.21230, df=2, p=0.5454) binomial distribution with parameter p=0.5773. The mathematical expectation of 1.7319 and the standard deviation of 0.8840 with mode 2 (group of 36 respondents) were realized. A total of 57 answers are in the positive domain. This binomial distribution is centered with a slight slope to the positive response domain (Figure 8).

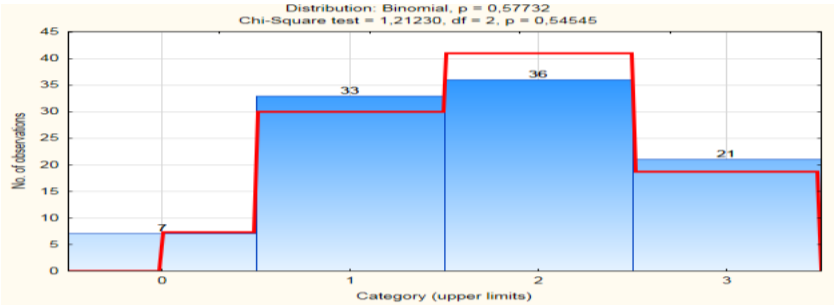

Fig. 8 Histogram of the significant binomial distribution of the employee structure problem in the digitization process
Source: The creator of the figure is the author (prim. aut.)

The distribution of answers to the question "Use of intranet platforms for information exchange (Wikis, blogs, podcasts...)" with the following answers ((0) do not use at all, (1) sometimes use, (2) often use, (3) always use) is not verified by significant (χ^2=17.01323, df=1, p=0.0001) binomial distribution with parameter p=0.3642. The answers to this question realized the mathematical expectation of 1.0927 and the standard deviation of 1.0905 with mode 0 (group of 39 respondents) (Figure 9).

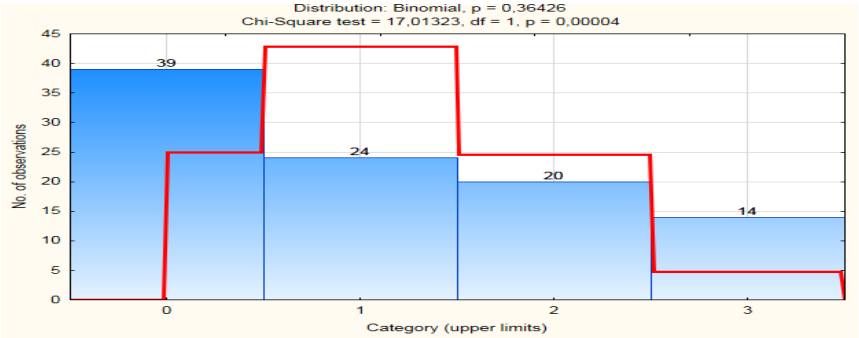

Fig. 9 Histogram of the non-significant binomial distribution of the use of intranet platforms for information exchange
Source: The creator of the figure is the author (prim. aut.)

The distribution of answers to the question: "E-commerce" with the following answers ((0) do not use at all, (1) sometimes use, (2) often use, (3) always use) was not verified by significance (p=0.0000) by binomial distribution with parameter p=0.1097. The answers to this question realized a mathematical expectation of 0.3298 and a standard deviation of 0.8000 with a mode of 0 (group of 79 respondents) (Figure 10).

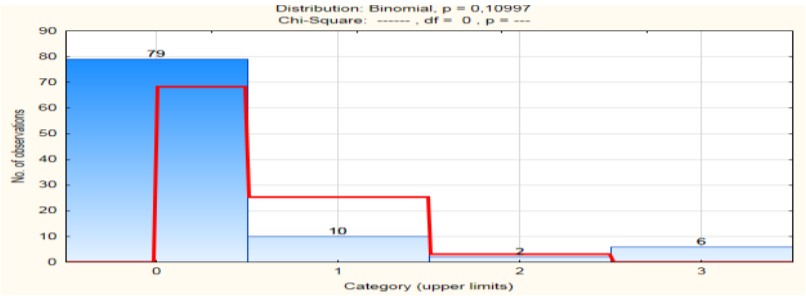

Fig. 10 Histogram of non-significant binomial distribution of E-commerce usage
Source: The creator of the figure is the author (prim. aut.)

The distribution of answers to the question: "Do you use an interface for exchanging information with business partners?" with the following answers ((0) do not use at all, (1) sometimes use, (2) often use, (3) always use) was not verified by significant (χ^2=31.97603, df=1, p=0.0000) binomial distribution with parameter p=0.1615. The answers to this question realized a mathematical expectation of 0.4845 and a standard deviation of 0.8910 with a mode of 0 (group of 71 respondents) (Figure 11).

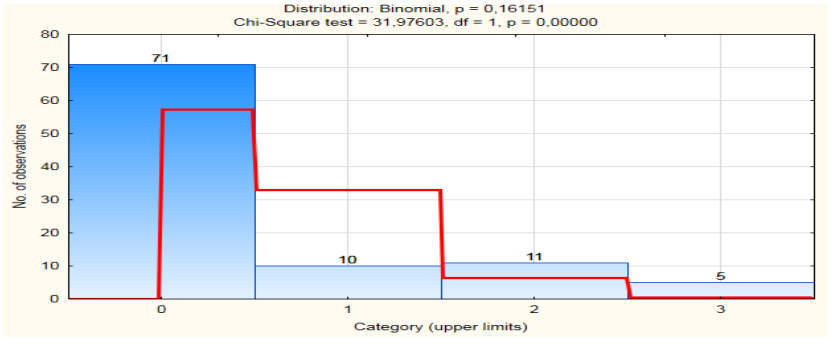

Fig. 11 Histogram of the non-significant binomial distribution of the use of the interface for exchanging information with business partners
Source: The creator of the figure is the author (prim. aut.)

The distribution of answers to the question: "Usage of cloud applications" with the following answers ((0) do not use at all, (1) sometimes use, (2) often use, (3) always use) was not verified by significant (χ^2=26.42078, df=1, p=0.0000) binomial distribution with parameter p=0.2749. The responses realized the mathematical expectation of 0.8247 and the standard deviation of 0.0409 with mode 0 (group of 53 respondents) (Figure 12).

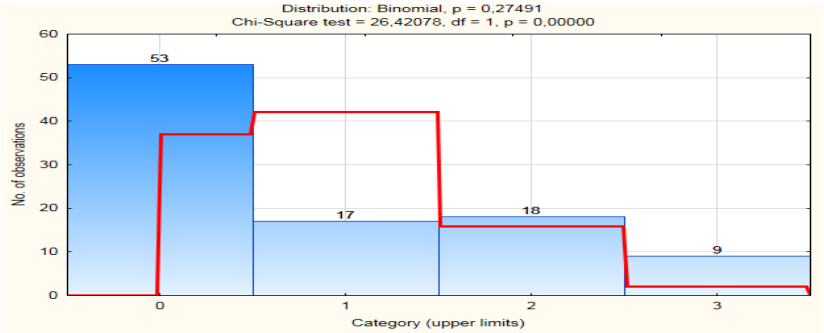

Fig. 12 Histogram of non-significant binomial distribution of cloud application usage
Source: The creator of the figure is the author (prim. aut.)

The distribution of answers to the question: "Data analysis using Big data" with the following answers ((0) do not use at all, (1) sometimes use, (2) often use, (3) always use) by binomial distribution with parameter p=0.1443. The answers realized the mathematical expectation of 0.4329 and the standard deviation of 0.8768 with mode 0 (group of 74 respondents) (Figure 13).

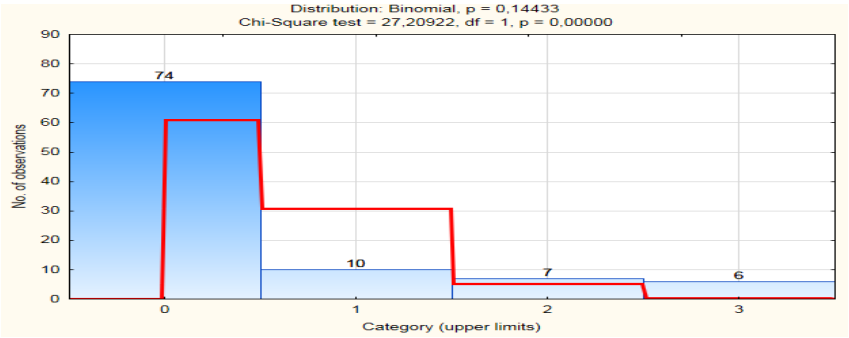

Fig. 13 Histogram of non-significant binomial distribution of the use of Big data
Source: The creator of the figure is the author (prim. aut.)

The Signum test additionally confirmed a significant difference (p<0,0001) between the unverified binomial distributions of the answers to the questions "Usage of cloud applications" and "Data analysis using Big data", i.e. we can point out that, although modest, the use of cloud applications is significantly more common than "Big data" analysis.

Digital skills of employees. The questions: "Number of workers who have a license or certificate as proof that they have digital skills (at least basic)" and "Number of workers (without license or certificate) who have practical skills and competences to master digital skills" were expanded by the complement: "Number of workers (without a license or certificate) who do NOT have practical skills and competences to master digital skills" and are calculated as a percentage (%) in relation to the number of workers. The following was established:

In 58 organizations, up to 10% of workers have a license or certificate as proof that they have digital skills (at least basic), or 5 organizations have 90% to 100% of employees who have a license (Figure 14).

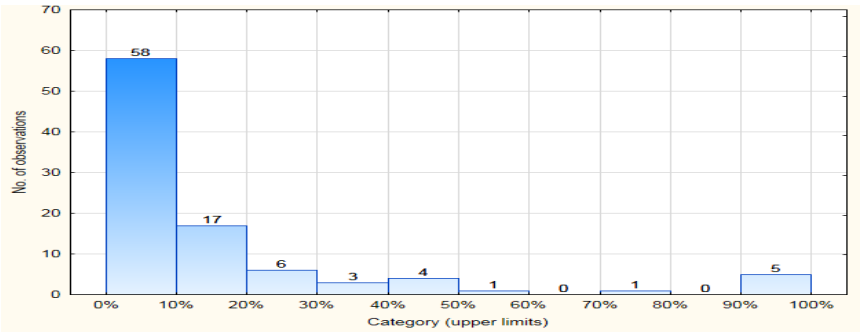

Fig. 14 Histogram of the number of workers with a license or certificate as proof that they have digital skills (at least basic)
Source: The creator of the figure is the author (prim. aut.)

In 29 organizations, 30% to 40% of workers without a license or certificate have practical skills and competencies to master digital skills, or 6 organizations have 90% to 100% of employees who possess (master) digital skills without a license (Figure 15).

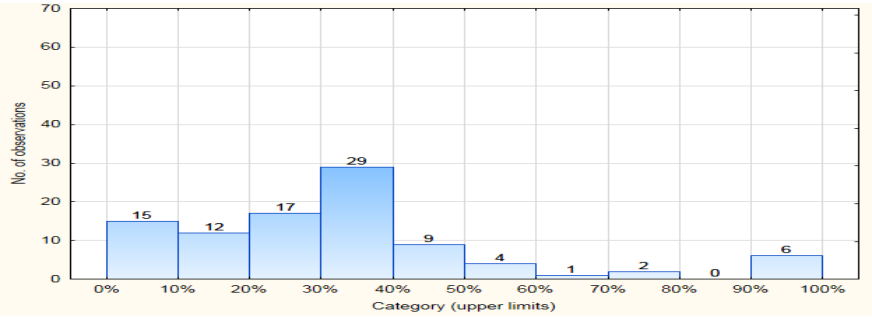

Fig. 15 Histogram of the number of workers (without a license or certificate) who have practical skills and competencies to master digital skills
Source: The creator of the figure is the author (prim. aut.)

In 22 organizations, 60% to 70% of workers do not have digital skills (Figure 16).

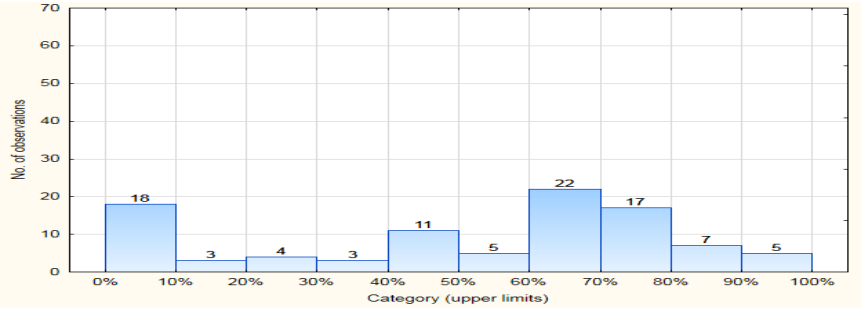

Fig. 16 Histogram of the number of workers (without a license or certificate) who do not have practical skills and competencies to master digital skills
Source: The creator of the figure is the author (prim. aut.)

In order to measure the knowledge breadth, we will use the plans according to which the education in the field of digitalization is carried out, the number of certified and expert lecturers, the number of sources of knowledge, patents and creativity (Farazi et al., 2019; Lodh & Battaggion, 2015; Moorthy & Polley , 2010).

The distribution of answers to the question: "Current digital skills of employees" with the following answers ((0) none, (1) weak, (2) good, (3) very good) was not verified by significant (χ^2=9.58069, df=2, p=0.0031) binomial distribution with parameter p=0.4398. The answers realized the mathematical expectation of 0.1.3196 and the standard deviation of 0.7295 with mode 1 (group of 54 respondents) (Figure 17).

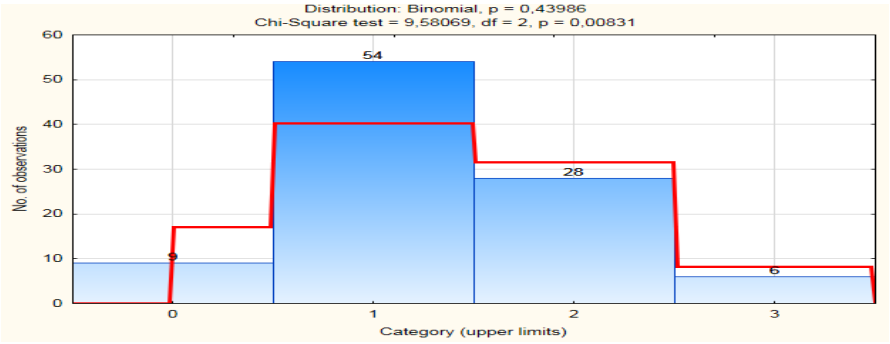

Fig. 17 Histogram of non-significant binomial distribution of current digital skills
Source: The creator of the figure is the author (prim. aut.)

The distribution of answers to the question: "Do you have developed education plan for employees?" with the following answers ((0) NO, (1) YES) was verified by the elementary binomial distribution with the parameter p=0.2577. The answers realized the mathematical expectation of 0.2577 and the standard deviation of 0.4396 with mode 0 (group of 72 respondents) (Figure 18).

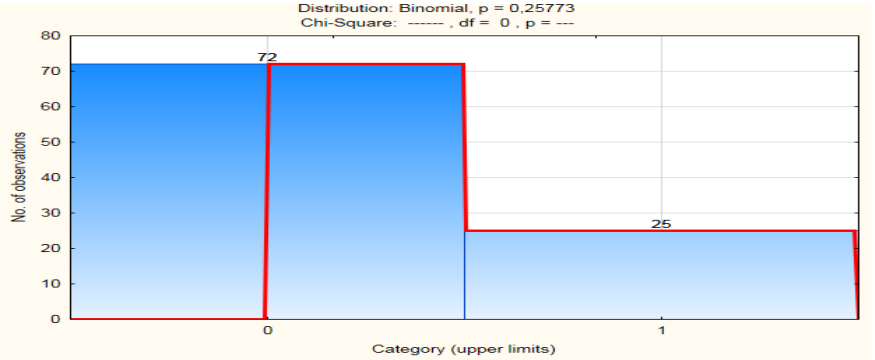

Fig. 18 Histogram of the elementary binomial distribution of the employee education plan
Source: The creator of the figure is the author (prim. aut.)

The distribution of answers to the question: "How do you ensure the acquisition of digital knowledge and skills of employees (you can choose several answers at the same time)?" is as follows:

None.....3
On-the-job training 76
Training outside the organization.....39
Seminars 51
Practice in other institutions.....3
Trainings. 26

Distribution of answers to the question: "How easily do you find experts in the field of application of digital technologies who can transfer adequate knowledge to training

participants?" with the following answers ((0) very difficult, (1) difficult, (2) easy, (3) very easy), was not verified by significant (χ^2=11.63623, df=2, p=0.0029) binomial distribution with parameter p=0.4192. The answers realized the mathematical expectation of 1.2577 and the standard deviation of 0.6658 with mode 1 (group of 51 respondents) (Figure 19).

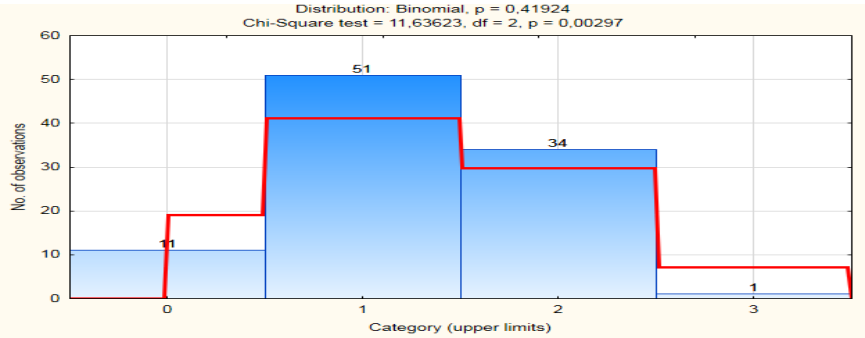

Fig. 19 Histogram of non-significant binomial distribution of access to experts
Source: The creator of the figure is the author (prim. aut.)

The distribution of answers to the question: "How satisfied are you with the competences and expertise of the lecturer?" with the following answers ((0) completely dissatisfied, (1) dissatisfied, (2) satisfied, (3) completely satisfied) was not verified by significant (χ^2=38.54537, df=2, p=0.0000) binomial distribution with parameter p=0.6151. The answers realized the mathematical expectation of 1.8454 and the standard deviation of 0.5465 with mode 2 (group of 72 respondents) (Figure 20).

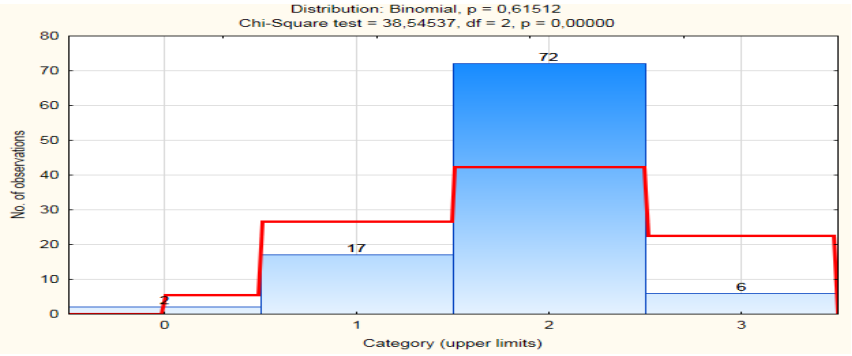

Fig. 20 Histogram of significant binomial distribution of satisfaction with lecturers' competences and expertise
Source: The creator of the figure is the author (prim. aut.)

Distribution of answers to the question: "Workers are motivated to acquire skills and knowledge necessary for the application of digital technologies" with the following answers ((0) completely disagree, (1) do not agree, (2) agree, (3) completely agree) was not verified by significant (χ^2=17.94343, df=2, p=0.0001) binomial distribution with parameter p=0.6118.

The answers realized the mathematical expectation of 1.8351 and the standard deviation of 0.6069 with mode 2 (group of 59 respondents) (Figure 21).

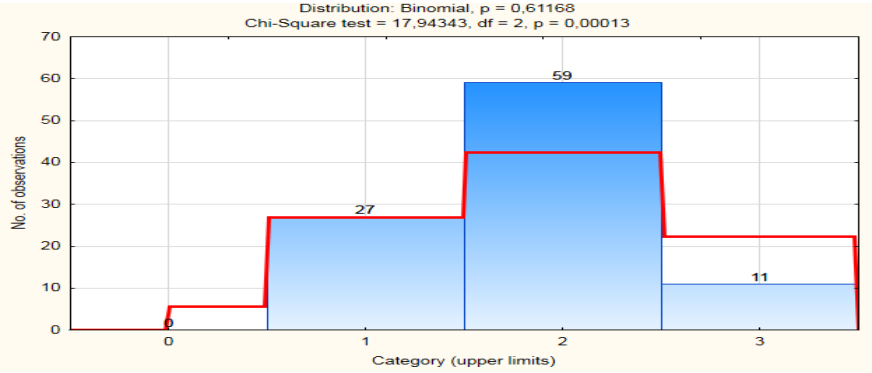

Fig. 21 Histogram of non-significant binomial distribution motivated to acquire skills and knowledge necessary for the application of digital technologies
Source: The creator of the figure is the author (prim. aut.)

The distribution of answers to the question: "Workers acquired satisfactory digital skills after the training" with the following answers ((0) completely disagree, (1) do not agree, (2) agree, (3) completely agree) was not verified by significant (χ^2=30.12363, df=2, p=0.0000) binomial distribution with parameter p=0.6185. The answers realized the mathematical expectation of 1.8557 and the standard deviation of 0.5588 with mode 2 (group of 68 respondents) (Figure 22).

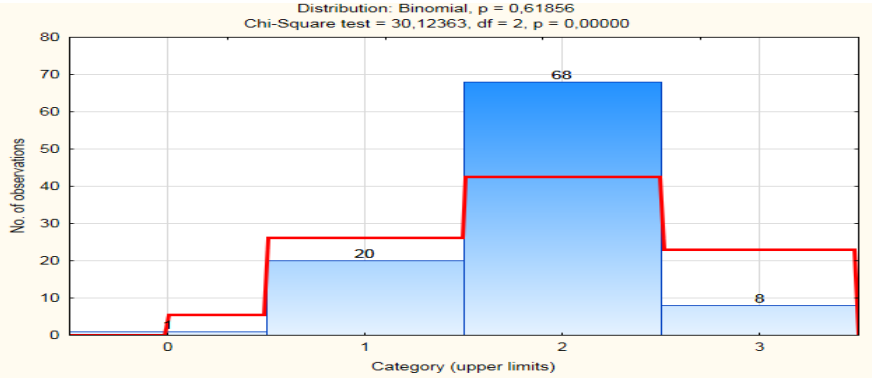

Fig. 22 Histogram of the non-significant binomial distribution of the acquisition of satisfactory digital skills
Source: The creator of the figure is the author (prim. aut.)

The distribution of answers to the question: "Does your organization own a patent?" with the following answers ((0) NO, (1) YES) was verified by elementary binomial distribution with parameter p=0.0103. The answers realized the mathematical expectation of 0.0103 and the standard deviation of 0.1015 with the mode 0 (group of 96 respondents) (Figure 23).

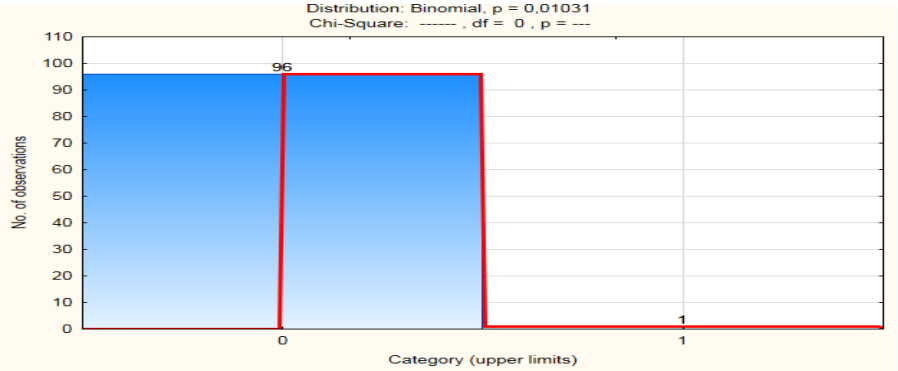

Fig. 23 Histogram of elementary binomial distribution of patent ownership
Source: The creator of the figure is the author (prim. aut.)

The distribution of answers to the question: "Creativity of workers" with the following answers ((0) no creativity, (1) low level of creativity, (2) high level of creativity, (3) very high level of creativity) was verified by significant (χ^2=0.29000, df=1, p=0.5902) binomial distribution with parameter p=0.6701. The answers realized the mathematical expectation of 2.0103 and the standard deviation of 0.7568 with mode 2 (group of 42 respondents) (Figure 24).

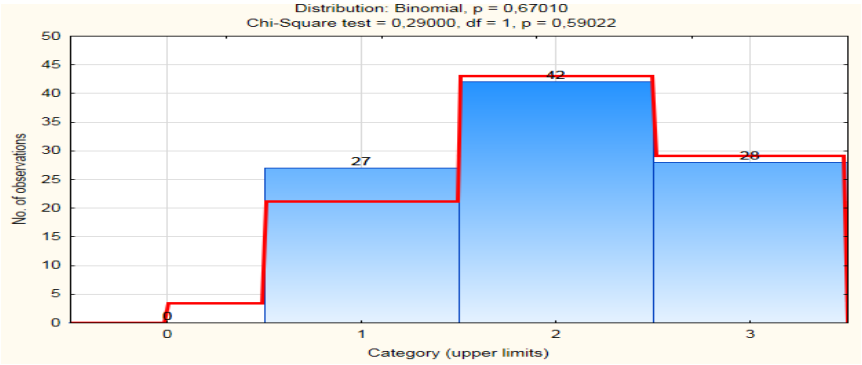

Fig. 24 Histogram of the significant binomial distribution of worker creativity
Source: The creator of the figure is the author (prim. aut.)

Analyzing the variance by Duncan's test, we came to the observed results. The distribution of answers to the question "Current digital skills of employees" was not verified by a significant binomial distribution (p=0.0031) and had the following answers respectively:

(0) none.....9
(1) weak.....54
(2) good.....28
(3) very good.....6

The mathematical expectation of 1.3196 with mode 1 (group of 54 respondents) is consistent with the response of weak digital skills of employees.

If the question of the current digital skills of employees is considered as a factor - grouping variable, and the question "Average life expectancy of employees" as a dependent variable, the following results of Duncan's variance analysis test are obtained (Table 2):

Table 2 Average age in relation to current digital skills of employees

	(0)	(1)	(2)	(3)
Average:	41.111	42.849	38.036	36.833
(0) none		0.6391	0.4073	0.2796
(1) weak	0.6391		0.2235	0.1417
(2) good	0.4073	0.2235		0.7456
(3) very good	0.2796	0.1417	0.7456	

Source: The creator of the table is the author (prim. aut.)

The distribution of answers to the question "Current digital skills of employees" was not verified by binomial distribution, so we conclude that part of the answer was subjective. The analysis of variance did not highlight significant results, but it is important to note that "none" and "weak" digital skills were established for average ages above 40, and "good" and "very good" for average ages below 40.

If we set "Current digital skills of employees" as a factor, and the question: "Do you have developed education plan for employees?" as a dependent variable, which is an elementary binomial distribution with a mean value of 0.4396 (72 answers NO and 25 answers YES) we get the following results of Duncan's analysis of variance test (Table 3):

Table 3 Existence of developed education plan in a relation to the current digital skills of employees

	(0)	(1)	(2)	(3)
Average:	0.2222	0.1111	0.3928	1.0000
(0) none		0.4772	0.2758	0.0001
(1) weak	0.4772		0.0900	0.0000
(2) good	0.2758	0.0900		0.0003
(3) very good	0.0001	0.0000	0.0003	

Source: The creator of the table is the author (prim. aut.).

According to Table 3, we can conclude that very good digital skills of employees are achieved exclusively and extremely significantly in organizations that have a developed education plan. The distribution of answers to the question "How easily do you find experts in the field of digital technology application who can transfer adequate knowledge to training participants" was not verified by a significant binomial distribution (p=0.0029) and had the following answers respectively:

(0) very difficult.....11
(1) difficult.....51
(2) easy.....34
(3) very easy.....1

The mathematical expectation of 1.2577 with mode 1 (group of 51 respondents) agrees with the answer of the difficulty of finding experts in the field of application of digital technologies who can impart adequate knowledge to the participants of the training.

We set the answer to the question "How easily do you find experts in the field of application of digital technologies who can transfer adequate knowledge to training participants?" as a factor, and the question "Current digital skills of employees" as a dependent variable, and we get the following results of Duncan's analysis of variance test (Table 4).

Table 4 Current digital skills of employees in relation to the ease of reaching experts in the field of application of digital technologies who can impart adequate knowledge to training participants

	(0)	(1)	(2)	(3)
Average:	0.9090	1.1765	1.6471	2.0000
(0) very difficult		0.6083	0.1846	0.0469
(1) difficult	0.6083		0.3678	0.1383
(2) easy	0.1846	0.3678		0.4990
(3) very easy	0.0469	0.1383	0.4990	

Source: The creator of the table is the author (prim. aut.)

Analysis:

The distribution of answers to the question "How easily do you find experts in the field of application of digital technologies who can transfer adequate knowledge to training participants?" and "Current digital skills of employees" was not verified by binomial distributions, so we conclude that the part of the answer was subjective.

First, let us remind that the mean value of digital skills of employees was 1.3196. Organizations that:

- "very difficult" find an expert have a rate of 0.9090 of employees' digital skills (below average),
- "difficult" find an expert have a rate of 1.1765 of employees' digital skills (below average),
- "easy" find an expert have a rate of 1.6471 of employees' digital skills (above average),
- "very easy" find an expert have a rate of 2.000 of employees' digital skills (above average).

Although subjective answers were given to both cross-questions, the analysis of variance highlights one significant difference between the extreme answers. These are "very difficult" finding experts which results in "no" digital skills of employees and "very easy" finding experts which results in "very good" digital skills of employees.

The distribution of answers to the question: "Workers are motivated to acquire skills and knowledge necessary for the application of digital technologies" was not verified by a significant binomial distribution (p=0.0001) and had the following answers respectively:

(0) completely disagree.....0
(1) disagree 27
(2) agree 59
(3) completely agree 11

The mathematical expectation of 1.8351 with mode 2 (group of 59 respondents) is in agreement with the answer "I agree" in relation to the motivation of workers to acquire

skills and knowledge necessary for the application of digital technologies. We set the answer to the question "Workers are motivated to acquire skills and knowledge necessary for the application of digital technologies" as a factor, and the question: "Current digital skills of employees" as a dependent variable, and we get the following results of Duncan's analysis of variance test (Table 5):

Table 5 Motivation of workers in relation to current digital skills

	(0)	(1)	(2)	(3)
Average:	/	0,7407	1,3898	2,3636
(0) completely disagree	/	/	/	/
(1) disagree	/	0,0005		0,0001
(2) agree	/	0,0001	0,0001	
(3) completely agree	/		0,0005	0,0001

Source: The creator of the table is the author (prim. aut.)

Analysis:

The distribution of answers to the question "Workers are motivated to acquire skills and knowledge necessary for the application of digital technologies" and "Current digital skills of employees" was not verified by binomial distributions, so we conclude that part of the answer was subjective.

Let us remind that the mean value of digital skills of employees was 1.3196. Regardless of the subjectivity of the answer, we unreservedly conclude that the perceived motivation of employees is a key factor in the current digital skills of employees. All the values in the table (there were no answers "completely agree") highlight significant differences.

If the question "The current structure of employees is a big problem in the process of digitalization of business" is considered as a factor - grouping variable, and the question "Workers are motivated to acquire the skills and knowledge necessary for the application of digital technologies" as a dependent variable, the following results of Duncan's analysis of variances are obtained (Table 6):

Table 6 The influence of the current structure of employees on the motivation of workers to acquire skills and knowledge necessary for the application of digital technologies

	(0)	(1)	(2)	(3)
Average:	2,5714	2,2121	1,5278	1,5223
(0) none		0,0365	0,0001	0,0000
(1) weak	0,0365		0,0002	0,0002
(2) good	0,0001	0,0002		0,9814
(3) very good	0,0000	0,0002	0,9814	

Source: The creator of the table is the author (prim. aut.)

The distribution of answers to the question "Workers are motivated to acquire skills and knowledge necessary for the application of digital technologies" was not verified by binomial distribution, so we conclude that part of the answer was subjective. Nevertheless, we conclude that the structure of employees has a significant impact on the motivation of workers to acquire the skills and knowledge necessary for the application of digital technologies.

When we talk about the number of sources of knowledge, our respondents use 5 sources: training at the workplace (76 respondents), seminars (51), training outside the organization

(39), trainings (26) and practice in other institutions (3). Three respondents answered that they do not use any sources, mainly because of financial resources. Our respondents combined several sources, as can be concluded from the answers, with the fact that on-the-job training is used the most.

To the question: "Does your organization own a patent?" as many as 96 out of 97 respondents answered that they do not own a patent, while one respondent answered positively.

The distribution of answers to the question "Creativity of workers" was verified by a significant binomial distribution (p=0.1490) and had the following answers respectively:

(0) no creativity.....0
(1) low level of creativity.....27
(2) high level of creativity.....42
(3) very high level of creativity.....28

The mathematical expectation of 2.0103 with mode 2 (group of 42 subjects) is in agreement with the response of a high level of creativity.

If the question "Creativity of workers" is considered as a factor - grouping variable, and the question "Average life expectancy of employees" as a dependent variable, the following results of Duncan's analysis of variance are obtained (Table 7):

Table 7 Creativity of workers in relation to the age of employees

	(0)	(1)	(2)	(3)
Average:	/	44,385	40,667	38,036
(0) no creativity	/	/	/	/
(1) low level of creativity	/		0,1096	0,0096
(2) high level of creativity	/	0,1096		0,2558
(3) very high level of creativity	/	0,0096	0,2558	

Source: The creator of the table is the author (prim. aut.).

Analysis:

- There was no answer "no creativity".
- The answer "low level of creativity" was given in 27 organizations where the average age is 44,385 years.
- The answer "high level of creativity" was given in 42 organizations where the average age is 40,667 years.
- The answer "very high level of creativity" was given in 42 organizations where the average age is 38,036 years.

The group with a "very high level of creativity" has the lowest average age (38.036), which is significantly different (p=0.0096) from the highest average age (44.385) found in the group with a "low level of creativity".

In conclusion, the average age has an impact on creativity, younger workers (under 40) have a significantly higher level of creativity than older (over 40).

If the question "The current structure of employees is a big problem in the process of digitalization of business" is considered as a factor - grouping variable, and the question "Creativity of workers" as a dependent variable, the following results of Duncan's analysis of variance are obtained (Table 8):

Table 8 The influence of the current structure of employees on the creativity of workers

	(0)	(1)	(2)	(3)
Average:	2,5714	2,4242	1,9444	1,2857
(0) none		0,5037	0,0072	0,0000
(1) weak	0,5037		0,0312	0,0001
(2) good	0,0072	0,0312		0,0035
(3) very good	0,0000	0,0001	0,0035	

Source: The creator of the table is the author (prim. aut.).

The distribution of answers to the question "Creativity of workers" was verified by binomial distribution, so we conclude that the answers are objective. We conclude that the structure of employees has a significant influence on the creativity of workers.

Researching of the knowledge breadth, we based entire questionnaire on the already mentioned measures: the plans according to which the education in the field of digitization is carried out, the number of certified and expert lecturers, the number of sources of knowledge, patents and creativity, and the previous results established that the social entrepreneurship entities do not have a knowledge breadth at a satisfactory level that would lead to the acceleration of the digitization process.

The motivation of workers, which is necessary to accept digitalization, can be achieved with the help of adequate education, in which workers gain new knowledge and thereby strengthen their self-confidence (Jha et al., 2017). Modern and high-quality educational plans of companies and cooperation with educational institutions are emerging as key factors in the successful implementation of digital transformation in numerous sectors (Day et al., 2019). "The digital transformation of business has slowly covered all aspects of society and an increasing number of companies are joining the trend of paperless business" (Riedl et al., 2017, p. 477).

Based on the results of our research and their analysis, we see that the knowledge breadth is a significant factor in encouraging the digitization of business. The research showed that the breadth of knowledge in the field of digitalization among social entrepreneurship entities is not at an enviable level. Innovations arise from ideas, through creativity and knowledge. "Commercialization of innovations refers to activities that are necessary for the introduction of innovations on the market" (Nambisan & Sawhney, 2007; Nerkar & Shane, 2007, cited in Petković, 2021, p. 278). According to Xu (2015), the knowledge breadth has a direct impact on innovation. According to the research of previous literature, we have seen that digitization and innovations in modern business are a key factor not only for success but also for survival on the market. Modern business cannot be imagined without digital technology. It is necessary to expand the knowledge of all employees in the field of digitization in order to provide the conditions for placing innovations on the market. Therefore, one of the ways to improve the development of social entrepreneurship is to accelerate its digitization. The distribution of responses that measure the breadth of knowledge in the field of digitization based on the collected data from the research (Table 2 - Table 8) shows that it can significantly influence the development of social entrepreneurship by accelerating the process of business digitization. The research results show that the development of social entrepreneurship is at a low level, and that digitalization can help its development. Expanding knowledge in the field of digitization will contribute to its acceleration and thus improve the development of social entrepreneurship. We have seen from research that employee education plans, expert lecturers and trainers, motivation

and creativity can help expand knowledge in the field of digitization. Therefore, we confirm the hypothesis and conclude that expanding the knowledge of employees in the field of application of digitization will contribute to the development of social entrepreneurship.

Based on the results of the research and the facts collected through the review of the literature, we see that the social entrepreneurship entities should pay much more attention to expanding the knowledge of both managers and other employees. In this way, the digitization of business would be brought to a satisfactory level. Social entrepreneurship is important for the development of the economy and society, and it is necessary to continuously work on its development in order to solve certain economic and social problems. Digitization of the operations of social entrepreneurship entities is necessary for development in today's digital era.

6. DISCUSSION

Like us, del-Corte-Lora et al. (2016) used regression analysis to determine the impact of knowledge breadth on innovation. They used different sources of knowledge as measures. In their research, they also proved that the knowledge breadth is a significant factor that affects the technological advantages and innovations of organizations. Farazi et al. (2019) used discovered technological advantage (patents, licenses, innovations) to measure knowledge breadth in their research. These authors, like us, have proven that knowledge breadth is a significant resource of technological developments. Lodh & Battaggion (2015), like us, use patents and creativity as measures of knowledge breadth in their research. The knowledge breadth, according to them, is a significant factor influencing the achievement of technological and competitive advantage on the market. Jegede (2017) investigated the impact of knowledge on innovation and concluded that knowledge is a significant factor in achieving the results of both technological and non-technological factors. Our research, as mentioned above, showed that the knowledge breadth significantly affects the digitalization of business and that it is necessary that employees in social entrepreneurship entities expand their knowledge in order to accelerate the digitalization process.

In our work, we have proven that digitalization is important for the development of social entrepreneurship. There are other researches who proved this too. According to Rachinger et al. (2019) digitalization of business contributes to success, simplifies the use of many systems, changes the daily routine of business and creates opportunities for business innovation. Kergroach (2020), Thrassou et al. (2020) and Garzoni et al. (2020) in their research state numerous advantages of digitization in small businesses. One of these advantages is easier and better communication with customers, where digitalization enables companies to better understand the needs of their customers and monitor the success of their marketing moves. It is easier to direct activities to the target group of customers. The next advantage is the faster transformation of the product according to the customer's requirements. Digitization enables daily insight into changes in customer expectations and, accordingly, faster product transformation. Another advantage is the relief of employees from daily repetitive operations, so they can devote themselves to more important business activities.

How important social entrepreneurship is, and what is its role in society and the economy, is shown by the data that social enterprises were less vulnerable during the global economic crisis - for example, in the economic sector of Italy, the number of employees

decreased drastically during the crisis, but in social cooperatives, that number increased by 2.7% in 2009 (Petričević, 2012, p. 12). Kraus et al. (2017) state that the influence of social entrepreneurship is increasing, and it is reflected in the adoption of more and more neoliberal government policies, which coincide with the reduction of public spending on social inequalities and ecological challenges, then through the increase of interest and activity in social enterprises on a global level.

7. CONCLUSION

In this research, 97 subjects of social entrepreneurship from all over B&H participated. The research showed that knowledge about digitalization is at a low level and that it needs to be expanded in order to speed up digitalization and lead to the improvement of social entrepreneurship development. This can be seen from the reviewed literature, as well as from the results of empirical research. We have come to the conclusion that the knowledge breadth is very important for accelerating the digitization process in social entrepreneurship entities. It has a significant positive effect on the digitization process and thus enables the acceleration of that process. We concluded that digitization is a condition for the survival of business entities on the market and that must be accelerated so that business entities can adapt to today's economic conditions. Digitization of business in social entrepreneurship entities in B&H refers to text processing and the use of smart phones and the Internet for communication, while advanced software are almost never used. As a result, these entities do not use all advantages that digitization offers. Accelerating and improving the digitization process can lead to the growth and development of social entrepreneurship. Improved development of social entrepreneurship would lead to a reduction in unemployment, a reduction in social aid, a reduction in ecological problems, better health care, that is, to the society and economy development. So, the main conclusion of this research is that it is necessary to invest in expanding knowledge because it contributes to accelerating the digitalization of social entrepreneurship. In this way, the development of social entrepreneurship, which contributes to social and economic development, takes place.

The scientific and pragmatic contribution of the research. The scientific contribution is reflected in the analytical, theoretical and empirical significance of this research. The analytical significance of the research represents the possibility of determining the development direction of B&H. Knowledge is an important resource, and through research we have proven that it affects the process of digitization and thus can lead to the improvement of the development of social entrepreneurship. Social entrepreneurship with all its advantages can lead to economic development. This research contributes to the existing theories in this field of research. Researching the literature, we came to the conclusion that this is still an under-researched area in domestic and foreign literature. There is a small number of papers that deal with the connection between knowledge breadth and digitalization. Results of empirical research proved that knowledge breadth affects digitalization of the business and that social entrepreneurship contributes to the development of economy and society.

When we talk about a pragmatic contribution, this work enables the application of the obtained results in practice, and that will be useful for decision-makers in social entrepreneurship entities, because it shows the advantages of knowledge breadth and its influence on the digitalization process. This research will contribute to investors; getting

to know about the advantages of social entrepreneurship. We believe that the obtained results will also be useful to the academic community, which will be able to learn more about the role and significance of the knowledge breadth in making a decision about the digital transformation and about the development of social entrepreneurship. Considering that the research in this area is relatively recent, we expect that this paper will arouse greater interest in the academic community for research in this field. The research can be interesting to the general public because it shows the significance of the development of social entrepreneurship that should be the driving force for solving economic and social problems in developing countries.

Limitation of the research. The first limitation of the research modest financial possibilities, which are a big obstacle for more extensive research. There is a small number of available papers in this area of research. The biggest problem relates to the collection of data about the number of subjects of social entrepreneurship in B&H. It was impossible to find the exact number of subjects of social entrepreneurship on the territory of B&H. Not a single competent institution has information about it. We came to the respondents in various ways, through social entrepreneurship forums and associations and by respondents sharing the questionnaires among themselves. So the exact population of social entrepreneurship subjects in B&H remains unknown. What we do know is that it is not a large population and that it does not have enough influence on the development of society and the economy.

Future research. We leave open the questions about the number of subjects of social entrepreneurship to future researchers, questions about other influencing factors on the digitalization such as digital infrastructure, knowledge depth, motivation, etc. Except digitalization as an influencing factor to the development of social entrepreneurship, there are others, like sources of funding for initial business activities, legal regulations, etc. Future researchers can deal with obstacles to the development of social entrepreneurship in underdeveloped countries, as well as their elimination. Future researches could be focused on innovating business models and the importance of innovation in social entrepreneurship.

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ZNAČAJ ŠIRINE ZNANJA U PROCESU DIGITALIZACIJE SOCIJALNOG PREDUZETNIŠTVA

Jedan od načina rešavanja ekonomskih i društvenih problema je socijalno preduzetništvo. U današnjem turbulentnom okruženju, pitanje opstanka postavlja se svim privrednim subjektima, pa i onima koji posluju kao subjekti socijalnog preduzetništva. Digitalizacija poslovanja je neophodan proces u inoviranju poslovnih modela. U ovom istraživanju posmatrali smo uticaj širine znanja na proces digitalizacije poslovanja subjekata socijalnog preduzetništva. U cilju merenja širine znanja koristili smo planove edukacije iz oblasti digitalizacije, broj sertifikovanih i stručnih predavača, broj izvora znanja, patente i kreativnost. Osnovni cilj istraživanja je da se utvrdi da li širina znanja može doprineti ubrzanju procesa digitalizacije socijalnog preduzetništva i na taj način doprineti njegovom razvoju. U istraživanju je učestvovalo 97 subjekata socijalnog preduzetništva iz Bosne i Hercegovine (BiH). Podaci su prikupljeni pomoću upitnika i analizirani korišćenjem metoda korelacije i regresije. Istraživali smo značaj širine znanja u procesu digitalizacije socijalnog preduzetništva. Prema rezultatima istraživanja, širina znanja značajno utiče na primenu digitalizacije u subjektima socijalnog preduzetništva.

Ključne reči: socijalno preduzetništvo, širina znanja, digitalizacija, ekonomski i društveni razvoj

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TRADITION AND CULTURE AS THE BASE FOR THE TOURISM PRODUCT: CASE OF UNESCO INTANGIBLE HERITAGE

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Abstract. *The traditional Serbian folk dance Kolo was included in the UNESCO Representative List of the Intangible Cultural Heritage of Humanity in 2017. Kolo is a communal folk dance that is performed at both public and private celebrations of the most significant occasions in people's lives and the lives of communities. Kolo is an important socially integrating component of Serbian cultural heritage. The paper investigates the potential of learning Serbian dance as part of the cultural tourism offer of different regions in Serbia. Data were obtained through a survey using the Likert scale and analysis using SmartPls software. The aim of this research is to examine the tradition of local tourism based on folklore culture with which tourists have cultural contact as well as the effect of culture and tradition on the intention and interest in folklore culture. The study reveals a high and statistically significant positive impact of motivation for travel, culture, tradition and interest in Serbian traditional dance - kolo.*

Key words: *intangible cultural heritage, cultural tourism, Serbian cultural heritage, UNESCO*

JEL Classification: Z10, Z32

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1. INTRODUCTION

Although cultural heritage is increasingly recognized as a potential catalyst for tourism, many cultural heritage events are in the making, both in academia and the general public. The idea of researching cultural tourism based on folklore culture arose during research and conclusions that the UNESCO Representative List of the Intangible Cultural Heritage is used by many countries to transform existing tourist values and create a competitive advantage of a locality (Leimgruber, 2010). In addition, folklore is part of the cultural heritage that develops in a community and is characteristic of that community (Kusmana et al., 2020).

In the past, folk culture represented a system of folk customs that determined the daily life and ceremonies of members of already established social communities. As a result of social and economic changes, the whole system has changed and the events in our daily lives are not the same. However, customs are constantly and continuously passed between and within groups of people and civilizations. Folklore, which belongs to these particular traditions, is common in many nations, particularly in the Balkan Peninsula. By adding kolo to the UNESCO Representative List of the Intangible Cultural Heritage of Humanity in 2017, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) acknowledged the significance of folklore as a form of tradition in Serbian society (UNESCO, 2022).

UNESCO World Heritage List is also used as a means of attracting large numbers of tourists, given that the tangible or intangible heritage on this list is an important attraction for tourists (Ryan & Silvanto, 2009; Huang et al., 2012). The number of tourists visiting World Heritage Sites is steadily increasing (Shackley, 2006; Yang et al., 2010), which encourages communities to preserve it and present it in the best possible manner to tourists. Bearing in mind the importance of the UNESCO cultural heritage list, the subject of research in this study is the examination of folk culture and tradition in the context of cultural tourism based on Serbian folklore. The paper also gives recommendations for a new modern form of tourism - creative tourism that can represent a new strategy for attracting tourists to a destination (Richards, 2009; Richards, 2020). According to Portuguese creative tourism network, creative tourism combines different elements of tourism and creative content and incorporates them into the lifestyle. Consumers or travelers desire to participate actively in the experience and explore their creative potential or activities in the location (CREATOUR, 2017).

Using multidimensional and multinational social research, the paper explores the role of intangible cultural heritage on the tourism map of the Republic of Serbia. The results of the investigation are based on new empirical evidence developed in 2021 through a questionnaire and data processing in the SmartPls software package. The goals of this research are reflected in specifying the significance of the intangible cultural heritage through a theoretical approach and examining the ways, factors and contexts of the spread of national customs and traditions through Kolo dance.

Taking the motivation of tourists for cultural tourism, McKercher et al., (2005) point out that *culture as a tourist attraction can be a powerful force in the claim that the historical, cultural, religious and industrial past of the region should be preserved.* Based on the relationship between motivation, cultural contact and tourism, the following hypotheses were derived:

H1: Motivation for travel has a positive effect on tradition and cultural contact in tourism

H2: Tradition and cultural contact in tourism have a positive effect on the interest in the dance Kolo.

The Kolo dances are almost always performed to commemorate the most significant occasions in people's and groups' lives, making them a very enduring and current national emblem. Cultural and artistic organisations maintain the continuation of the practice while institutions and local communities ensure its prominence through planning local, regional, and national festivals and competitions. The most frequent method of talent transfer is through active engagement, and skilled players inspire others to learn.

The paper presents and integrates intangible heritage, folklore and cultural tourism in the context of the tourism industry in an original way. This paper provides a new view of cultural tourism and opportunities to create an original tourism offer through the connection of cultural tourism. This is supported by the increasing tourism income and the growth of tourism in the post-Covid period. In the Republic of Serbia, folklore is a form of intangible folk art that is rich in spiritual values that are connected to traditions, festivals, songs, dances, and legends. Each of the regions in the Republic of Serbia has its own kolo story, custom or tradition presented at numerous festivals and tourist events. With this in mind, the idea for a new form of tourism emerged, especially in the post-Covid period.

2. THEORETICAL BACKGROUND

According to the World Tourism Organization (2018) survey on culture and tourism, the majority of respondents classified cultural tourism into two parts: tangible cultural heritage (e.g. national and world heritage sites, monuments, historical sites and buildings, cultural roads, etc.) and intangible heritage (e.g. crafts, gastronomy, traditional festivals, music, oral tradition, religious / spiritual tourism). According to this research, as much as 35.8% of the incoming tourist market belonged to cultural tourism.

The relationship between tourism and the intangible cultural heritage has been the subject of research by many authors (Du Cros, 2001; Lenzerini, 2011; Rodzi et al., 2013). In the contemporary setting, cultural heritage is a crucial component of travel and is increasingly becoming a draw for travelers (Leask, 2016), especially for the development of intangible tourism destinations (Filipović, 2018; Zdravković & Peković, 2021).

Cultural tourism, of which cultural heritage tourism is part (Du Cros, 2001) is one of the fastest growing components of tourism in many countries (Çela et al., 2009), as is the case of Serbia. Cultural heritage has been gaining importance lately, not only for its economic benefits but also for its serious approach to sustainability (Heo, 2012). Due to the growth of mass tourism, cultural heritage tourism is endangered and a serious approach to preserving the sustainability of this specific and rare type of tourism is needed (Loulanski & Loulanski, 2011).

Intangible cultural heritage depicts the natural and cultural landscape of the Republic of Serbia by pointing out the multiethnic characteristics of the people, and tourist promotion restores the identity of the Serbian people through the meeting place of cultures, religions and languages (Bjeljac et al., 2015).

Relatively little attention has been given in literature about relationships between travel motivation, cultural framework, and interest in folklore culture (McKercher et al., 2005; Terkenli & Georgoula, 2021). For example, Hall & Weiler (1992) concluded that the motivation of travelers is primarily determined by a special interest with a focus on activities in a specific destination. In addition, the authors Swarbrook & Horner (1999)

added that a tourist with a special interest is highly motivated to develop a new interest and learn something new about the location he is visiting. Recent research shows that very significant cultural attractions that are valorized for tourism purposes are actually promoted cultural heritages to which local traditions, folklores and artistic events have been added (Terkenli & Georgoula, 2022).

The cultural and folklore potential of a country is extensive and is made up of components that connect a rural way of life to material and spiritual culture (Iordache et al., 2008). The UNESCO Representative List of the Intangible Cultural Heritage of Humanity's inclusion of the Kolo (traditional folk dance), Slava (christened slava), and singing to the accompaniment of the gusle represents a significant advancement for Serbian culture (Sananin & Dramianin, 2019) and rebrands Serbia (Bjeljac et al., 2015a). Intangible cultural heritage is a particularly attractive element of tourism services. The idea of intangible cultural heritage, as outlined in the Convention for the Safeguarding of Intangible Cultural Heritage (Convention, 2003), should be taken into account when discussing ethnology. In this sense, the promotion of ethnological elements in the tourism industry, as part of intangible heritage, is one of the promising ways to preserve ethnic diversity. This is because the desire to comprehend various occurrences in ethnic and cultural domains led to the mixing of many types of tourism activities known as ethno and cultural tourism (Aleksandrova & Aigina, 2014). A combination of all these elements can form a tourism brand. Globally recognized intangible elements of Serbia's cultural heritage potentially lead to more tourists (Krasojević & Djordjević 2017).

Folklore is an integral part of the cultural tourism resource (Jie, 1998) and it has an important integrative social function, nurturing a collective identity. It carries the hallmark of local and regional identity and serves as a symbol of the national community (Applegate, 1999).

However, the assessment of the impact of folklore on tourism resources and its practical value in stimulating the tourism industry is still pending. For this reason, attention remains to be paid to present and future research. A study by the authors Chang et al. (2012) showed that most respondents were interested in the folklore dimension of traveling or traveling for pilgrimage. Also, in his research, the author Bochenek (2013) pointed out the strong link between cultural heritage tourism and folk dance learning.

Folklore, customs and tradition are specific tourism resources of national and regional identity in the age of globalization. They are becoming a tourist product to millions of people around the world and provide reasons for cultural and creative tourism. Folklore, or traditional dance, is a family-friendly hobby that has been handed down through the ages. The results of a study by Filippou et al. (2010) indicate that more and more highly educated individuals in Greece attend folklore-related festivals and prefer folklore as a folk play. The results obtained by these authors can be singled out as important for tourism development. First of all, the majority of the surveyed respondents are those who have been attending folklore lessons for a long time and can thus be characterized as drivers of the development of recreational tourism. These respondents, that is, the hosts, represent a stable basis for the tourist offer, and travel agencies can create offers based on traditional folklore learning courses in a particular country.

3. Study Area

The Republic of Serbia is located in the central part of the Balkan Peninsula, at the intersection of roads and various influences coming from the north and south, east and west. Over the centuries, Serbia has had different political systems, but it has remained a multiethnic state with different ethnic communities living on its territory: Slovaks, Hungarians, Romanians, Albanians, Croats, members of the Roma community etc. (Korhecz, 2021). Different ethnic minorities live together with the majority population and have their own language, customs, name, religion and cultural tradition. People that have inhabited the Balkan Peninsula for centuries have left behind a rich cultural legacy, and the growth and durability of their cultures have been impacted by the region's recurrent political upheaval. So, there are different customs, rituals, skills and techniques in the Balkans that represent the intangible cultural heritage and are the identification point of the Balkan people. The ongoing process of cultural exchange involves the transfer of traditions, rituals, and knowledge from one generation to the next. Due to this exchange, cultural similarities that are becoming apparent can be identified, such as folk costumes and dance practices called Kolo, that is, folklore and the rituals and dances associated with it. The spread of customs and traditions creates the basis for the development of cultural tourism. Because of its impact on the social, cultural, historical, and environmental environments, tourism is an extremely complex societal phenomenon. A great heterogeneity of the area provides many opportunities for tourism. For example, studies on the cultural heritage and impact of tourism and the intangible cultural heritage highlight the significant role of tourism and the greatest potential for economic growth and development (Terzić et al., 2015).

Fig. 1 Map of research area
Source: Authors by using https://www.mapchart.net/europe.html

Serbia is a significant component of the Balkan Peninsula's traditional ethno folklore culture. Serbia boasts the following list of intangible cultural heritage verified by UNESCO: 1) the Slava, the celebration of the family's patron saint's day, listed in 2014; 2) the Kolo, a traditional folk dance, listed in 2017, 3) the Gusle singing, listed in 2018 and 2020: 4) Zlakusa pottery production, hand-wheel pottery production in the Zlakusa village (RL) (UNESCO, 2020) and 5) Social practices and knowledge related to the preparation and use of the traditional plum spirit – šljivovica (2022).

4. DATA AND METHODS

During the research, an anonymous questionnaire was used, which was distributed via the Google platform. The questionnaire contained 22 questions, where 80 valid answers were collected and processed for further data processing. When collecting answers, a five-point scale was used (possible answers on a scale from 1 to 5). The research was conducted in the period May-October 2021 in order to cover both the period of the intensive season and the part outside the tourist season. The questionnaire was distributed in English, taking into account the expectations of visiting foreign tourists.

Based on the outcomes of earlier study and a combination of those results, the questions were modified and changed (Htun & Chaisawat 2008; Henriques&Custódio, 2008; Stokes, 2017; Rina, 2021) with certain modifications in light of the Serbian context. There are four sections to the questionnaire. The first component collects background data on respondents. The next segment is related to factors influencing the tourists' decision to travel to Serbia and motivation for travel. The third section presents the respondents' opinion about sharing national customs and traditions. The last, fourth section, analyzes the tourists interest in folklore. The sections and abbreviations are the following:

- general information about respondents,
- factors influencing their decision to travel to Serbia and motivation for travel (MTT: indicators from mtt_1 to mtt_8)
- presentation of their opinion about sharing national customs and traditions (SNC: indicators from snc_1 to snc_11)
- analysis of their interest in folklore (TIF: indicators from tif_1 to tif_13)

Data analysis is based on SEM - PLS statistics using Smart-PLS 3.0. The analysis of the model of the structural equation with partial least square (SEM - PLS) is appropriate for using small samples to examine the association between variables in tourist research. The covariance-based method and the variance-based method are two methods that can be used to analyze SEM. Demographic statistics of the sample are presented below.

According to the data shown in Table 1, the largest number of respondents were female (76%), while the number of male respondents was significantly lower (24%). The majority of responders (45.3%) were between the ages of 30 and 39. Most of the respondents have advanced degrees (master's or doctoral), as far as education is concerned. Most respondents are engaged by an employer (73.3%) and have an income ranging from 500 EUR to 3,000 EUR. Only 32% of respondents associate their occupation with culture.

Table 1 The survey sample

Question	Answer option	Number of respondents
Q1. Gender	1) Male	24%
	2) Female	76%
Q2. Age	1) under 20 yrs	0%
	2) 20-29 yrs	30.7%
	3) 30-39 yrs	45.3%
	4) 40-49 yrs	13.3%
	5) 50-59 yrs	6.7%
	6) over 60 yrs	4%
Q3. Education	1) primary school	0%
	2) high school	1.3%
	3) bachelor's degree	42.7%
	4) master's degree	37.3%
	5) PhD	18.7%
Q4. What is your occupation?	1) student	9.3%
	2) employed	73.3%
	3) self-employed	9.3%
	4) retired	1.3%
	5) unemployed	4%
	6) other	2.7%
Q5. Your monthly income?	1) up to 500 EUR	14.7%
	2) 500-1000 EUR	28%
	3) 1000-3000 EUR	45.3%
	4) More than 3000 EUR	5.3%
	5) I don't want to make statement	6.7%
Q6. Do you work in the field of culture?	1) yes	32%
	2) no	68%

Source: Author's calculation

Table 2 Descriptive Statistics in analysis tourists interest in folklore

	Min.	Max.	Mean	Std. Deviation
TIF 1: Types of dance you preferred when you travel in some destination?	2.00	5.00	3.6296	1.00568
TIF 2: How important do you think the knowledge of [Residents]	1.00	5.00	3.4074	.93064
TIF 3: How important do you think the knowledge of [National Visitors]	1.00	5.00	3.1111	1.05003
TIF 4: How important do you think the knowledge of [Foreign Visitors]	1.00	5.00	3.3704	1.00568
TIF 5: To what extent do you consider that could contribute to: [Increasing community participation]	3.00	5.00	3.9259	.78082
TIF 6: To what extent do you consider that could contribute to: [Revitalizing the tradition]	2.00	5.00	3.9259	.82862
TIF 7: To what extent do you consider that could contribute to: [Appreciating the cultural identity]	2.00	5.00	3.7037	.91209
TIF 8: To what extent do you consider that 3 could contribute to: [Improving the destination image]	1.00	5.00	3.5926	1.21716

Source: Author's calculation

Due to differences in occupations as well as the level of earnings, it is important to mention the country of origin of the respondents who filled out the questionnaire. Except Serbia, the dominant numbers of respondents were from the following countries: North Macedonia (5%), Croatia (13%), Poland (2%), Germany (3%), Romania (8%), Ukraine (3%) and Austria (2%).

5. Results and Discussion

Based on a number of factors that influence the motivation for travel, the authors opted for factors that are in the domain of national customs and traditions and interest in folklore. With this in mind, the authors basically use the theoretical model proposed by Rina (2021) with some modifications. The proposed Rina's model has been modified to some extent. The measurement model by the author Rina also consisted of three latent variables (Intention to Revisit, Visitor Engagement and Cultural Contact). The model used in this study also uses three latent variables, namely: motivation for travel which is related to the latent variable Visitor Engagement. The variable cultural frame in this study is identified with the latent variable cultural contact, while the variable interest in folklore is renamed and modified based on the previously set variable Intention to Revisit. Bearing in mind that the previous sample model contained questions related to the use of questions related to English for tourism, those parts were removed and aligned with the research on the traditional Kolo dance.

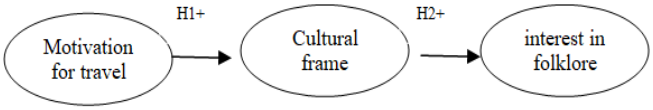

Fig. 2 Theoretical model
Source: Author's calculation

The model parameters were evaluated using the Smart PLS 3 software suite. Determination of the value of Cronbach's Alphas was used in order to evaluate the model's validity and the results are displayed in Table 3.

Table 3 Construct Reliability Statistics

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Cultural frame	0.832	0.872	0.861	0.379
Interest in folk culture	0.915	0.93	0.929	0.512
Motivation for travel	0.767	0.819	0.818	0.381

Source: Author's calculation

The Confirmatory Factor Analysis (CFA) was used to evaluate the sample's internal satisfied. Confirmatory Factor Analysis (CFA) was used to evaluate the sample's internal consistency and validity. The internal consistency was calculated using Cronbach's coefficient (Cronbach, 1951). According to Nannally (1978), values below 0.7 are prioritized, meaning

the observed model's internal consistency criteria have been met. Table 3 shows the obtained values of Construct Reliability Statistics.

After the model's validity and fit were confirmed, the value of the regression coefficient was determined. The PLS-SEM model's outcome is depicted in Figure 3 as a result.

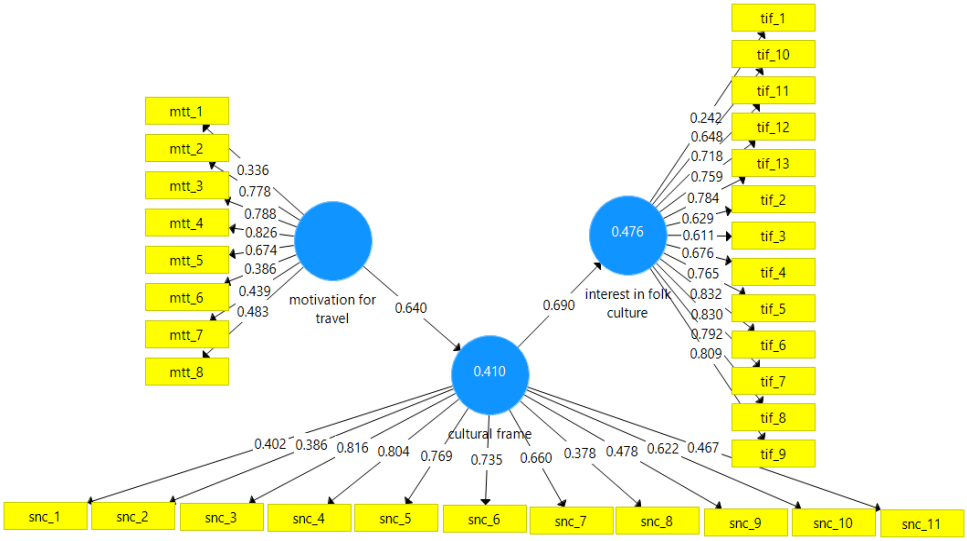

Fig. 3 Structural model
Source: Author's calculation

All of the regression coefficients and the R square, which are represented by the blue circles of the latent variables, are positive, according to the data displayed in Figure 2. This demonstrates the validity of the initial study hypotheses. In order to assess the significance of the specified hypotheses, it is also important to determine the significance of the acquired coefficients.

Table 4 Regression coefficients after the bootstrapping process

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Cultural frame → interest in folk culture	0.6900	0.7080	0.0620	11.1410	0.0000
Motivation for travel → cultural frame	0.6400	0.6620	0.0750	8.4970	0.0000

Source: Author's calculation

The findings in Table 4 reveal that, at the level of p 0.05, every regression coefficient is statistically significant. Given that the regression coefficient (0.6900) demonstrating the link between cultural context and folklore interest is relatively high, it can be said that hypothesis H1 is supported. The association between travel motivation and cultural frame likewise yielded a positive regression coefficient (0.6400), supporting the conclusion that hypothesis H2 is true.

The results therefore indicate a high positive and statistically significant impact of influence of the cultural framework on the interest in folklore culture among tourists who visited the Republic of Serbia. The results can be connected with the claims of the authors Antón et al., (2017) who show that the internal drivers of individuals who are related to learning local customs in the destination are precisely the drivers for the attractiveness of the destination. Related to the second hypothesis, the results also showed a high and positive statistically significant relationship between travel motivation and cultural framework. In fact, the results reproduce the fact that the traditional culture of the people in destination is an important motivation for travel. Having that in mind, the author Pettersson (2006) points out that tourism demand can be stimulated by local culture, both traditional and non-traditional customs and handicrafts, which will increase the number of visitors.

6. CONCLUSION

Based on the presented theoretical and empirical part of the study, it can be pointed out that cultural tourism is certainly a significant element of tourism for many destinations. However, few studies have focused on travel experiences (Seyfi et al., 2020). This study sought to contribute and improve the understanding of folklore tourism as one of the elements of cultural tourism and thereby contribute to lessening the gap between the experiences in cultural tourism. It is particularly important that this study contributes to the ongoing efforts to enhance the cultural experiences of tourists as an element for the destination's competitive advantage.

The obtained research results confirmed all the factors that were included in the analysis. All factors that have been researched (interest in folk culture, motivation for travel, cultural frame) have a positive effect on the interest in folklore as a tourism resource in the Republic of Serbia. Although the factors under investigation have a significant impact on interest in folklore, the relationship between the *cultural framework* and the interest in folklore was found to have the strongest regression coefficient, suggesting that future events should pay special attention to being improved and utilized for tourist purposes.

Legends, beliefs, folk tales, songs and dances along with folk dances have always been an important cultural asset of the community. They represent specific cultural expressions of utmost importance for national identity. In addition to the social, they are an important element of tourism development and of the sense of the traditionality of a place. This is in agreement with the authors Xi and Wei (2010) who pointed out that a tourism product without cultural connotation will not have long-term vitality and appeal.

In general, the opinions of respondents toward folk culture and tradition can be deduced as follows:

- The importance of preserving tradition is very important for all respondents.
- The Republic of Serbia has a lot of potential to develop into a destination for tourists based on cultural tourism grounded in tradition, which could indicate the potential for the growth of creative tourism.
- Folklore is an important basis for creating a tourist package of services in Serbia, since 50.6% of respondents prefer folklore when visiting a destination.

Given that the questionnaire was distributed online and that women responded more frequently than men, the study's shortcomings might be seen in the small number of respondents.

The survey's findings provide a solid foundation for further study in the area of tradition- and folklore-based cultural tourism. Deeper multidisciplinary research that will contribute to academia and society can be established based on this exploratory research.

It can also be argued that tourism commercialization and mass tourism have a detrimental effect on the authenticity of traditional local cultures. Various events are adapted to the demands of tourists and thus mass tourism harms traditional customs by creating "false folklore" (Terzić, 2015). Culture should not be sacrificed to promote tourism and add economic value at the cost of losing valuable cultural value.

The results have important theoretical implications in terms of being able to support and expand existing models of cultural tourism and, above all, intangible heritage-based tourism. Also, it should be borne in mind that the role of intangible heritage in terms of increasing motivation for travel is not sufficiently addressed in the literature on cultural tourism, so this research is another part of this important area of research. Certainly, the study deepened the analysis of travel motivations by adding quality and value from the aspect of cultural tourism.

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TRADICIJA I KULTURA KAO OSNOV TURISTIČKOG PROIZVODA: STUDIJA SLUČAJA UNESCO NEMATERIJALNE BAŠTINE

Tradicionalno srpsko narodno kolo upisano je na UNESCO listu nematerijalnog kulturnog nasleđa čovečanstva 2017. Kolo je kolektivna narodna igra i, kao neizbežan deo javnih i privatnih proslava najvažnijih događaja u srpskom društvu, značajan društveno integrativni element srpskog kulturnog nasleđa. U radu se istražuje potencijal učenja srpskog plesa kao dela kreativne turističke ponude različitih regiona u Srbiji. Podaci su dobijeni putem ankete korišćenjem Likertove skale i analizom pomoću SmartPls softvera. Cilj ovog istraživanja je ispitivanje tradicije lokalnog turizma zasnovanog na folklornoj kulturi sa kojom turisti imaju kulturni kontakt, kao i uticaja kulture i tradicije na nameru i interesovanje za folklornu kulturu. Studija otkriva visok i statistički značajan pozitivan uticaj motivacije za putovanje, kulturu, tradiciju i interesovanje za srpsku tradicionalnu igru – kolo.

Ključne reči: nematerijalno kulturno nasleđe, kulturni turizam, srpska kulturna baština, UNESCO

APPENDIX

The Questionnaire

I DEMOGRAPHIC						
Gender	male			female		
Age	under 20 yrs	20-29 yrs	30-39 yrs	40-49 yrs	50-59 yrs	over 60 yrs
Your country of residence?						
Maritial status	single	married	widowed	divorced	other	
Your education?	primary school	high school	academic studies (bachelor's degree)	master's degree	PhD	
What is your occupation?	student	employed	self-employed	retired	unemployed	Other
Your living area?	rural			urban		
Your monthly income?	up to 500 EUR	500- 1000 EUR	1000-3000 EUR	More than 3000 EUR	I dont want to make a statement	
Do you work in the field of culture?	yes		no			

II FACTORS INFLUENCING THE TOURISTS' DECISION TO TRAVEL TO SERBIA AND MOTIVATION FOR TRAVEL					
1. To which extent are you familiar with Serbia as a tourist destination (cultural, entertainment, historical, natural and anthropogenic resources)? (1- not at all, 5- very familiar)	**1**	**2**	**3**	**4**	**5**
2. Which factor is the primary factor which would influence you to travel to Serbia?					
personal interest / travel guide materials / websites / recommendations from family/relatives / recommendations from friends/co-workers / other					
• **Please mark to which extent a specific factor motivates you to travel? 1- does not motivate me , 5- motivates me to a large extent**					
3. experiencing the atmosphere of the place	**1**	**2**	**3**	**4**	**5**
4. discovering other cultures	**1**	**2**	**3**	**4**	**5**
5. learning new things and expanding knowledge	**1**	**2**	**3**	**4**	**5**
6. rest and recreation	**1**	**2**	**3**	**4**	**5**
• **Fill in the number on a scale that refer to Serbia as a cultural tourist destination (1 - I completely disagree; 2 - I disagree; 3 - I am neutral; 4 - I agree; 5 - I completely agree)**					
4. Serbia has the potential to be a world well-known cultural tourist destination	**1**	**2**	**3**	**4**	**5**
5. Cultural tourist attractions in Serbia are very diverse and unique	**1**	**2**	**3**	**4**	**5**
6. Serbian culture and traditions are very impressive and worth learning	**1**	**2**	**3**	**4**	**5**
7. Serbia is a must (cultural) tourist destination	**1**	**2**	**3**	**4**	**5**
III SHARING NATIONAL CUSTOMS AND TRADITIONS					
• **On a scale of 1 to 5, please rate the importance of national tradition and customs? (1- not at all important, 5-very important)**					
8. Sharing national customs and traditions is important.	**1**	**2**	**3**	**4**	**5**
• **Which cultural tourist attractions and activities are important for you when you visit some cultural destination? 1- not important at all; 5 - very important**					
9. local people and lifestyle	**1**	**2**	**3**	**4**	**5**
10. villages	**1**	**2**	**3**	**4**	**5**
11. cities	**1**	**2**	**3**	**4**	**5**
12. historical sites	**1**	**2**	**3**	**4**	**5**
13. music and dance	**1**	**2**	**3**	**4**	**5**
14. meditation centers	**1**	**2**	**3**	**4**	**5**
15. local sports	**1**	**2**	**3**	**4**	**5**
16. religious objects	**1**	**2**	**3**	**4**	**5**
17. pilgrimage tourism	**1**	**2**	**3**	**4**	**5**
IV TOURISTS' INTEREST IN FOLKLORE DANCE					
18. Types of dance you preferred when you travel in some destination?					
a. classic dance					
b. modern dance					
c. folklore dance					
d. ballroom dance					
• **How important do you think the knowledge of folk dance is to...? 1- not important at all 5 - very important**					
19. residents	**1**	**2**	**3**	**4**	**5**
20. national visitors	**1**	**2**	**3**	**4**	**5**
21. foreign visitors	**1**	**2**	**3**	**4**	**5**
• **To what extent do you consider that folk dance could contribute to:**					
22. Increasing community participation	**1**	**2**	**3**	**4**	**5**
23. Revitalizing the tradition	**1**	**2**	**3**	**4**	**5**
24. Appreciating the cultural identity	**1**	**2**	**3**	**4**	**5**
25. Improving the destination image	**1**	**2**	**3**	**4**	**5**
26. Promoting cultural tourism	**1**	**2**	**3**	**4**	**5**
• **To what extent do you think that the following steps and actions would enhance tourists' interest in folklore? 1 - they would not improve at all, 5 - they would improve completely**					
27. advertising	**1**	**2**	**3**	**4**	**5**
28. organizing folk dance workshops	**1**	**2**	**3**	**4**	**5**
29. making folk dance lessons an optional part of package tours	**1**	**2**	**3**	**4**	**5**
30. making folk dance lessons part of local tourist offer	**1**	**2**	**3**	**4**	**5**

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AGRI-FOOD PRODUCTS QUALITY AS EXPORTS COMPETITIVENESS DETERMINANT OF THE REPUBLIC OF SERBIA

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Abstract. *Products quality and safety are important determinants of countries' export competitiveness. Issues of the quality of agri-food products are gaining more and more importance, bearing in mind modern challenges and consumer needs. This is very important for developing countries, including the Republic of Serbia, bearing in mind the importance of this sector for exports and overall economic development. On the other hand, these countries are lagging behind developed countries in terms of quality standards, due to the expensive certification and quality standardization procedures. The growth of competitiveness should be achieved through the improvement of product quality standards, product differentiation and introduction of innovations in the agri-food sector. The goal of the research is to examine the quality of the most important export agri-food products of the Republic of Serbia. The unit value (UV) index, as a measure of product quality, is used to analyse the quality of the most important agri-food products on the most important export markets, with using secondary ITC data. The multiple regression determined that the improvement of agricultural products quality has a positive impact on the growth of exports and competitiveness of agri-food sector of the Republic of Serbia. Namely, the competitiveness of agri-food sector will depend primarily on the ability of this sector to respond to the requirements related to food safety and quality standards, as well as the possibility of investing and innovating processing capacities, in order to create a high-quality final product with high value added.*

Key words: *quality, UV (unit values) index, competitiveness, export, agri-food sector*

JEL Classification: L15, O10, O32, Q10

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INTRODUCTION

Nowadays, the topics of food safety and quality are very important. That is conditioned by growing consumer concern about food properties and growing awareness of the connection between food and health. In this context, the competition on the agri-food markets is increasingly shifting from price to quality. Consequently, strategies have been oriented towards increasing efficiency and quality control. There is a strong connection between competitiveness and product quality, i.e., it is believed that an increase in competitiveness can lead to an improvement in product quality (Curzi et al., 2014), and vice versa.

The quality of agri-food products, as well as the attributes that define it, have been developing for decades, and discussions related to this topic have focused a lot on issues related to the standardization of quality attributes (Rossi Scalco et al., 2020). Bearing in mind that improving the quality of products is very important for increasing the competitiveness of agri-food sector, the literature emphasizes that the application of innovative approaches in this area is necessary.

The subject of this paper is to determine the most important sectors and products of agricultural exports of the Republic of Serbia. The goal of the paper is to point out the high quality agricultural products of the Republic of Serbia and their importance for export and economic development. According to the subject and goal of the research, the following research hypotheses were established:

H_1: The high quality agricultural products have a significant impact on the export markets of the most important trade partners of the Republic of Serbia.

H_2: Improving the quality of agricultural products has a positive impact on the growth of exports and the competitiveness of the agri-food sector.

1. LITERATURE REVIEW

In the context of international trade, the standards of agri-food products are increasingly becoming a global phenomenon (Reardon & Berdegué, 2002). The agri-food sector is increasingly burdened by requirements regarding food safety and quality standards. Quality standards have evolved in response to consumer concerns about the quality of the food they consume (Henson & Hooker, 2001).

Many modern agri-food markets are structured in such a way that competition is mainly focused on quality (Busch & Bain, 2004). Consumers are increasingly focusing on a wider range of product attributes. These quality attributes include the way of production (organic production, animal care, etc.), the composition (pesticide residues, etc.), as well as broader implications of the agri-food on the environment. That is why the increasing focus of agri-food markets is centered on safety and quality of food (Henson & Reardon, 2005).

Quality is generally explained as the totality of product characteristics related to its ability to satisfy implied needs (Aung & Chang, 2014). Grades and quality standards consist of a set of terms and principles of classification and marking. Grades and standards refer to: quality (appearance, cleanliness, taste, etc.); safety (pesticides residues or other artificial substances, presence of microbes, etc.); authenticity (guarantee of geographical origin or application of traditional production methods); production process that respects the health and safety of people, as well as environmental protection (Reardon & Farina, 2001).

Although there are significant differences between food quality and safety, clear distinctions are often not made between these concepts (Röhr et al., 2005). These issues are increasingly important in the agri-food markets, as product quality has become an essential requirement for consumers (Grunert, 2005), so competition in the agri-food markets often shifts from price to quality and safety.

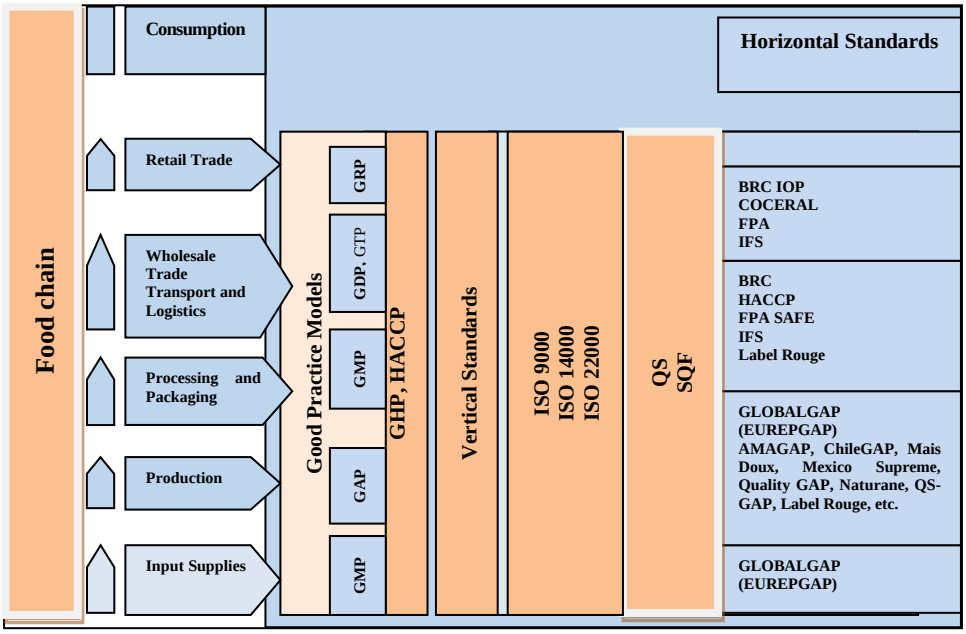

Fig. 1 Food quality standards
Source: Aung & Chang, 2014, p. 177.

Food safety and quality standards (Fig. 1) depend on specific requirements aimed at consumer welfare (Swinnen & Vandemoortele, 2009). As a result of modern consumer preferences, which imply a higher level of food safety and quality (De Moura et. al., 2009), global agricultural markets have become increasingly complex. Therefore, many companies focus on value-adding activities, offering high-quality and differentiated products (Cucagnaa & Goldsmith, 2018). Among food producers, vertical coordination becomes crucial to ensure access to a stable supply of agricultural products with the desired quality characteristics (Sexton & Xia, 2018).

Three well-known ways of quality assurance in the food sector are: Good Agricultural Practice (GAP), Hazard Analysis and Critical Control Points (HACCP) and the International Standardization Organization (ISO). More and more in the standardization process certain retail systems stand out, which include certain requirements for all key participants in the product distribution chain. Examples of these certification systems are the British Retail Consortium (BRC), European Retail Good Agricultural Practice (EUREPGAP, or GLOBAL G.A.P.) and Safe Quality Food (SQF) (Trienekens & Zuurbier, 2008). There are also so-called industry standards such as GFSI (Global Food Safety Initiative). GFSI consists of large market chains, such as Carrefour, Sainsbury's, Wal-Mart, Tesco, and etc., which aim to

increase quality and safety. This is very important to point out that IFS, SQF, BRC, HACCP, FSSC 22000 - consists of ISO 22000 and Food Safety Management Systems, etc. (Kotsanopoulos & Arvanitoyannis, 2017).

A business entity can benefit from QMS (Quality Management System) (Aggelogiannopoulos et al., 2007). Research on MQS (Minimum Quality Standards) shows that the imposition of a minimum product standard affects prices, quantities and types of products delivered, as well as the welfare of stakeholders. At the same time, the standards also affect the competition. The expected competitive advantage is an important reason for companies to accept more rigorous standards (Hammoudi et al., 2009). The QMS implementation is a way to improve product quality and strengthen competitiveness and exports. Implementation of the requirements of the ISO standard is an obligation for obtaining a QMS. Since 2007, the Republic of Serbia has implemented various standards (Djekic et al., 2013), as a measure of product quality to improve export competitiveness.

Food safety standards have become an increasingly important issue in global agri-food trade. Food safety standards particularly affect the ability of developing countries to gain access to agri-food markets in developed countries (Henson & Jaffee, 2008). The agricultural sector in developing countries should be included in the quality system, in order to fully ensure the quality of primary and processed products. The application of modern production technologies is very important for improving the quality, yield and business results of the agricultural sector (Jongwanich, 2009). Developing countries must adapt their production processes and products to the standards for food safety and quality in developed countries (Jouanjean, 2012). As a result of this and with the aim of increasing productivity and product quality, the transfer of technology from high-income economies to low-income economies is increasing (Goldberg & Pavcnik, 2007; Swinnen, 2007). Development policies aimed at increasing the competitiveness of agrarians, through innovations, simultaneously raise the issue of improving the quality of agricultural and food products (Curzi et al., 2014).

Unlike conventional agriculture, which emphasizes total yields, sustainable agriculture is based on quality and is environmentally acceptable (Lyson, 2002). There are more and more initiatives to direct agri-food systems towards sustainable development (Coteur et al., 2019). Some authors view sustainable agriculture in relation to food quality and environmental protection, while others focus on the ability of agriculture to maintain long-term productivity. At the same time, almost all authors agree on the importance of three components of sustainable agriculture: ecological, economic and social (Lichtfouse et al., 2009).

Improving product quality and yield, while reducing operating costs and reducing environmental pollution, is an essential goal of precision agriculture (Chlingaryan et al., 2018). The use of computers, infrared spectroscopy, magnetic resonance spectroscopy, X-ray, are just some of the techniques that it is believed can be used to identify and solve the challenges of monitoring agricultural production and analyzing food quality (Patrício & Rieder, 2018).

The agri-food sector of the Republic of Serbia realizes a positive and significant net export. It has a high share in total exports, employment and gross value added (Marković & Marjanović, 2021). Although Serbia has the biggest comparative advantage in the export of the agri-food products among the Western Balkans, it is necessary to increase the level of competitiveness of these products on the EU market and change the export structure, which is mainly based on products of a lower stage of processing, cereals, fruits and vegetables (Matkovski, 2021). Bearing in mind that the agri-food sector is a significant part of the exports of the Republic of Serbia, it is very important to analyse its

competitiveness. The EU is the most important foreign trade partner of the Republic of Serbia, both in terms of total exports and exports of agri-food products. Regarding the type of competition, quality competition is dominant at the EU market. Only vegetables and fruits from Serbia stand out for their quality on the EU market. That is why we should work on improving the quality of the products (Marković et al., 2019). The European Commission proposes that the CAP in the period 2021-2027 focuses on the goals of sustainable development of agriculture, by increasing the competitiveness of agriculture while taking care of the environment, health and food quality (European Commission, 2021). Agricultural production has a positive impact on economic development of the EU countries (Mladenović & Mladenović, 2023). Given that agriculture is a very important sector of the Republic of Serbia in the process of European integration, it is important to follow EU goals in the field of sustainable agricultural development (Zecevic et al., 2019) and to harmonize agricultural policy according to the CAP.

2. METHODOLOGY AND DATA

In order to improve the export structure of agricultural products of the Republic of Serbia, it is necessary to improve the quality of their production and apply new production technologies. Among the most important indicators in the analysis of foreign trade, but also internal competitiveness of exports, are the unit values (UV) of exports and imports (Marković & Marjanović, 2021). High-quality food is reflected in paying higher unit values for safety and quality food (Huang & Gale, 2009), so the UV index, as a direct measure of quality, was used as a measure of quality and necessary component of export improvement (McKelvey, 2011). UV indexes were and are used as a measure of the quality and for impact of certain products on the export (Fast et al., 2022). Fischer (2010) established a link between product quality (as indicated by UV) and export performance, as well as the competitiveness of the entire agribusiness sector. Aiginger (1997) determined that UV index, in addition to being used as a measure of the competitiveness and productivity of the economy, can also be compared with the concept of price and costs, i.e. product quality, depending on specific circumstances. One of its advantages is that information is available for all countries and for most products on nominal exports and imports, so analyses can be conducted for bilateral trade. UV (unit values) index is proposed as price proxies and measure of product quality, which is obtained by dividing the export value by the exported product quantities (Fischer, 2010):

$$UV^{k}_{ct} = \text{Export value}_{ct} / \text{Exported quantity}_{ct}, \quad (1)$$

where k represents the country, c the product and t the year.

Since UV (unit values) refers to homogeneous and comparable goods, the value may indicate differences in quality, assuming that unit costs of production are equal in all considered countries. However, it is difficult to determine with absolute precision and certainty whether high UV (unit values) index reflects high quality or high total production costs (Fischer, 2010).

However, activities with the different signs between the quantity balance and unit values revealed that the cost side dominates ($UV_{exp} < UV_{imp} \Rightarrow Q_{exp} > Q_{imp}$ and vice versa), but if the same signs are between the unit values and the export quantities it is about the quality-

dominated markets" ($UV_{exp} > UV_{imp} \Rightarrow Q_{exp} > Q_{imp}$ and vice versa), that is, demand is determined by quality (Aiginger, 1997, p. 576).

Due to the importance of product quality for increasing the export of the agri-food sector, the importance of quality of the most important export agri-food products on the most important export markets of the Republic of Serbia will be examined. The variables used for the research are shown in Table 1.

Table 1 Definition of variables relevant to the quality of agri-food products of the Republic of Serbia

Label	Definition
Dependent variables	
Exp	Total export (all products)
Exp_EU (28)	Export to the European Union
Exp_Ger	Export to Germany
Exp_Ita	Export to Italy
Exp_B&H	Export to Bosnia and Herzegovina
Agricultural independent variables	
UV_cor	Unit value - corn, in grain (excluding seed for sowing) – (6 digits - 100590)
UV_fro_fru	Unit value - frozen raspberry, blackberry and other fruits (6 digits - 081120)
UV_app	Unit value - apples, fresh (6 digits 080810)
Other independent variables	
Cov_{val}_ cor	Value coverage of imports by exports (export/import*100 - in US$) - corn, in grain (excluding seeds for sowing) - (6 digits - 100590)
Cov_{val}_ fro_fru	Value coverage of imports by exports (export/import*100 - in US$) - frozen raspberry, blackberry and other fruits - (6 digits - 081120)
Cov_{val}_ app	Value coverage of imports by exports (export/import*100 - in US$) - apples, fresh - (6 digits 080810)
Cov_{q}_ cor	Quantitative coverage of imports by exports (export/import*100 - in t) - corn, in grain (excluding seeds for sowing) - (6 digits - 100590)
Cov_{q}_ fro_fru	Quantitative coverage of imports by exports (export/import*100 - in t) - frozen raspberries, blackberries and other fruits - (6 digits - 081120)
Cov_{q}_ app	Quantitative coverage of imports by exports (export/import*100 in t) - apples, fresh - (6 digits 080810)

Source: Authors' research, based on ITC - Trade Map, 2020

Multiple regression will be used to examine the impact of quality of the most important export agricultural products on the total export of the Republic of Serbia, as well as on the export markets of the most important foreign trade partners for agri-food products export of the Republic of Serbia, which is Germany, Italy and Bosnia & Herzegovina, next to the EU in total (ITC - Trade Map, 2020):

$$Exp_{,t} = \alpha + \beta_1 UV\_cor_{i,t} + \beta_2 UV\_fro\_fru_{i,t} + \beta_3 UV\_app_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$Exp\_EU_{,t} = \alpha + \beta_1 UV\_cor_{i,t} + \beta_2 UV\_fro\_fru_{i,t} + \beta_3 UV\_app_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$Exp\_Ger_{,t} = \alpha + \beta_1 UV\_cor_{i,t} + \beta_2 UV\_fro\_fru_{i,t} + \beta_3 UV\_app_{i,t} + \varepsilon_{i,t} \quad (4)$$

$$Exp\_Ita_{,t} = \alpha + \beta_1 UV\_cor_{i,t} + \beta_2 UV\_fro\_fru_{i,t} + \beta_3 UV\_app_{i,t} + \varepsilon_{i,t} \quad (5)$$

$$Exp\_B\&H_{,t} = \alpha + \beta_1 UV\_cor_{i,t} + \beta_2 UV\_fro\_fru_{i,t} + \beta_3 UV\_app_{i,t} + \varepsilon_{i,t} \quad (6)$$

3. RESEARCH RESULTS

In addition to the most important countries to which the Republic of Serbia exports its products (Table 2), it is also important to observe the most important export agri-food products (Table 3), namely corn in the grain, fresh apples, frozen fruit (raspberries, blackberries, currants, etc.), of which in the frozen fruit, raspberry without sugar is the most important for export (SORS, 2020). Corn belongs to the cereal sector (10), and this sector is the most important agricultural export sector, followed by sector 08 (edible fruits and nuts), where frozen fruit dominates exports, followed by fresh apples (ITC - Trade Map, 2020).

Table 2 The most important export countries of the Republic of Serbia from 2006-2019, in 000$

Year	Total export	Export to EU	Export to Germany	Export to Italy	Export to B&H
2006	6427892	3866960	636960	926047	748963
2007	8824701	5265746	937491	1094269	1042136
2008	10972082	6387373	1141357	1128468	1338745
2009	8345076	4756364	870475	821336	1015613
2010	9794516	5921885	1008213	1118513	1088979
2011	11779478	7259129	1330706	1306232	1191424
2012	11229031	6894109	1308601	1203874	1074727
2013	14610779	9165483	1734413	2379430	1201516
2014	14843348	9593047	1773186	2576939	1318985
2015	13361043	8774981	1668614	2158893	1170981
2016	14832645	9810516	1936277	2162009	1227520
2017	16946130	11210678	2132600	2247489	1353975
2018	19157001	12861241	2296753	2351729	1510293
2019	19557555	13059158	2477551	1979512	1495549

Source: ITC - Trade Map, 2020

The following Table 3 shows the most important agri-food export sectors, as well as the most important agri-food export products within them.

Corn, in the observed period of 2006-2019, is the dominant export product in the cereal sector, with a large share, even more than half of the total export of cereals in most years (except in 2007, 2013 and 2018), but when it comes to edible fruit, the export is dominated by frozen fruit. However, that share has been decreasing in recent years compared to the earlier period, while it is increasing in the case of apples (Table 3).

Table 3 The most important sectors and products in the agricultural exports of the Republic of Serbia

Year	10 – Cereals			08 - Edible fruits				
	Total cereals export	Corn	Share of corn in cereals exports	Total edible fruits export	Frozen fruits	Apples	Frozen fruits	Apples
	000 $		%	000$			Share in edible fruits export, %	
2006	191484	173484	90.60	196892	123957	11691	62.96	5.94
2007	172946	69199	40.01	303659	170481	23810	56.14	7.84
2008	151521	96490	63.68	335670	204230	14611	60.84	4.35
2009	327146	261231	79.85	321471	206831	14964	64.34	4.65
2010	429022	312013	72.73	356496	187834	46419	52.69	13.02
2011	557065	432125	77.57	446996	209995	65799	46.98	14.72
2012	667911	532966	79.80	370589	180188	41480	48.62	11.19
2013	486789	159591	32.78	478612	231794	53025	48.43	11.08
2014	605084	448920	74.19	552999	277365	81307	50.16	14.70
2015	485085	333615	68.77	582589	308811	104177	53.01	17.88
2016	513302	336650	65.59	606487	278455	127633	45.91	21.04
2017	387355	268552	69.33	660454	265165	125751	40.15	19.04
2018	462672	214585	46.38	583908	260272	100512	44.57	17.21
2019	591458	486607	82.27	608076	271306	118559	44.62	19.50

Source: Authors' research, based on ITC - Trade Map, 2020

There are activities where the UV indicates costs and those where it indicates quality. If the low UV of exports leads to a higher amount of exports compared to the amount of imports ($UV_{exp} < UV_{imp} \Rightarrow Q_{exp} > Q_{imp}$ and vice versa), the cost side is dominant, because the theory indicates that most goods are price elastic. If a high UV leads to a higher amount of exports compared to the amount of imports ($UV_{exp} > UV_{imp} \Rightarrow Q_{exp} > Q_{imp}$ and vice versa), the quality is dominant, because theory indicates that prices can be higher if we concentrate on quality. Given that the low unit value of exports leads to a greater amount of exports compared to the amount of imports ($UV_{exp} < UV_{imp} \Rightarrow Q_{exp} > Q_{imp}$), it is concluded that corn dominates not in the quality, but in the cost side. In contrast to corn, the situation is the opposite with frozen fruits and apples, i.e. a high unit value leads to a higher amount of exports compared to the amount of imports ($UV_{exp} > UV_{imp} \Rightarrow Q_{exp} > Q_{imp}$), which means that demand is determined by quality (Table 4). The highest unit values of fruit exports are realized on the most important export market of Serbia, that is, the EU market. According to the UV, the fruit sector achieves a high competitiveness,

which should be an incentive for the production and export of fruit products in order to improve the structure of the overall export, especially when it comes to processed products (Marković & Marjanović, 2021). Besides, Serbia can be said to be a significant corn producer. But anyway agricultural production must be adapted to new conditions in order to improve quantity and quality of the corn production and export (Ilić et al., 2016).

Table 4 The quality of the most important export agricultural products of the Republic of Serbia (UV - unit values index as a measure of product quality with accompanying indicators)

Corn				Frozen fruits				Apples			
UV_{exp}	UV_{imp}	Q_{exp}	Q_{imp}	UV_{exp}	UV_{imp}	Q_{exp}	Q_{imp}	UV_{exp}	UV_{imp}	Q_{exp}	Q_{imp}
129	390	1345995	59	1506	1340	82321	1255	315	238	37140	12112
170	331	406270	148	2182	2408	78143	1435	321	305	74189	21387
180	159	537363	383	3315	2935	61601	1896	415	427	35206	16914
164	529	1591060	747	2799	2524	73884	1804	375	349	39957	12797
189	353	1653356	249	2140	2377	87765	1958	434	242	107007	29346
266	696	1621646	296	2093	1899	100331	2202	505	357	130182	32254
252	879	2118964	819	2113	1919	85286	4584	673	341	61642	47471
205	662	779290	2787	2894	2319	80108	5717	457	363	115938	28753
189	829	2372557	1464	2902	2467	95564	6201	598	333	135982	23418
160	1198	2090024	252	2558	2328	120705	7481	556	297	187366	58759
164	470	2056478	164	2569	2253	108382	6652	550	304	232223	75851
169	569	1587367	260	2145	1703	123599	13425	637	319	197406	65730
180	238	1195193	5832	1930	1598	134857	13099	694	344	144760	35727
163	207	2990355	1081	1831	1620	148184	12833	546	256	217001	33171

Source: Authors' research, based on ITC - Trade Map, 2020

Table 5 Determining quality, based on UVexp vs. UVimp (UV index for export vs. UV index for import) and Covval vs. Covq (coverage of imports by exports in value vs. coverage of imports by exports in quantity)

Average values for the period 2006-2019	Corn	Frozen fruits	Apples
Cov_{val}	197545.50	3037.38	593.11
Cov_{q}	540051.63	2824.2	360.05
The difference in %	**-173.88**	**+7.55**	**+64.73**
UV_{exp}	184.29	2355.5	505.43
UV_{imp}	536.43	2120.72	319.64
The difference in %	**-191.09**	**+11.07**	**+58.12**

Source: Authors' research, based on ITC - Trade Map, 2020

Based on the Table 5, it can be seen that in the case of corn, where the emphasis is not on quality and where the import price is higher than the export price, the coverage of import by export expressed in terms of value is lower than the coverage of import by export expressed in quantities, while in the case of products where the emphasis is on

quality (frozen fruits and apples) and export prices are higher than import prices, and the coverage of imports by exports expressed in terms of value is higher than the coverage of imports by exports expressed in quantities.

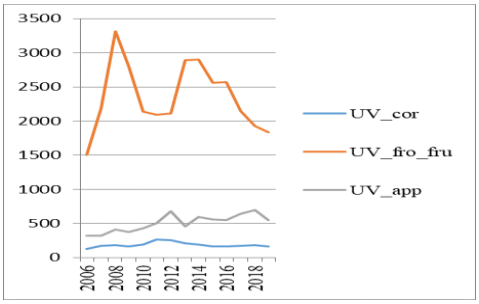

Fig. 2 Differences between UVexp
Source: Authors' research, based on ITC - Trade Map, 2020

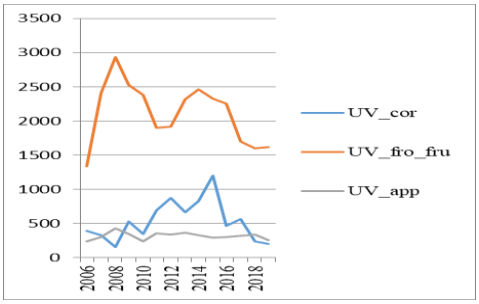

Fig. 3 Differences between UVimp
Source: Authors' research, based on ITC - Trade Map, 2020

Among the observed agricultural products, frozen fruit has the highest export and import prices, followed by apples, and corn has the lowest export price, while imported corn had a higher price than apples in the period from 2009-2018 (Fig. 2 & Fig. 3).

Table 6 Multicollinearity of research variables related to the quality of agri-food products of the Republic of Serbia

Label	Exp	Exp_EU (28)	Exp_Ger	Exp_Ita	Exp_B&H	UV_cor	UV_fro_fru	UV_app
Exp	1.00							
Exp_EU (28)	***0.99	1.00						
Exp_Ger	***0.99	***0.99	1.00					
Exp_Ita	***0.84	***0.85	***0.86	1.00				
Exp_B&H	***0.90	***0.88	***0.87	***0.68	1.00			
UV_cor	0.03	0.01	0.01	-0.05	0.12	1.00		
UV_fro_fru	-0.03	-0.08	-0.05	0.16	0.20	0.08	1.00	
UV_app	***0.76	***0.76	***0.76	***0.67	***0.66	0.36	-0.08	1.00

Source: Authors' research, based on ITC - Trade Map, 2020
Note: *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

Since the independent variables, measures of product quality, are not in multicollinearity (Table 6), they can be used in the same regression equations together.

Table 7 Impact of the quality of the most important export agricultural products on the export of the Republic of Serbia

Label	Model 1	Model 2	Model 3	Model 4	Model 5
Dependent variables	Exp	Exp_EU (28)	Exp_Ger	Exp_Ita	Exp_B&H
Intercept	3398256.97 (0.62)	2241362.22 (0.58)	262931.07 (0.34)	-34763.21 (-0.04)	*495715.76 (-1.52)
UV_cor	*-30823.40 (-1.39)	*-25619.33 (-1.63)	*-4968.78 (-1.62)	-6389.89 (-1.71)	-923.08 (-0.70)
UV_fro_fru	450.11 (0.30)	87.36 (0.08)	49.66 (0.24)	324.01 (1.27)	110.42 (1.23)
UV_app	***27951.76 (4.28)	***20727.07 (4.50)	***4063.60 (4.51)	4203.31 (3.83)	***1212.49 (3.15)
Adjusted R^2	0.54	0.57	0.57	0.49	0.38
F-statistic	***6.14	***6.82	***6.81	**5.15	**3.67

Source: Authors' research, based on ITC - Trade Map, 2020
Note: beta coefficients in front of parentheses, t-values in parentheses;
*, **, *** indicate statistical significance at the 10%, 5%, and 1% level, respectively

All tested models (Table 7) are statistically significant. It can be seen that the quality of corn has a statistically negative impact in the first three models. Regarding the impact of the quality of frozen fruit and apples on the most important export markets, as well as the total export, a positive impact of the quality of these products can be observed, with the fact that in the case of apples this impact is statistically significant (except the fourth one). The conclusion is that the quality of agricultural products is reflected in the competitiveness and export of the Republic of Serbia.

4. DISCUSSION

It is important for the Republic of Serbia to focus on products that are competitive on foreign markets based on quality (fruit), with support for the association of producers in clusters, through vertical and horizontal coordination, in order to achieve a higher export price. Nevertheless, attention should also be paid to cereals, first of all corn, considering its strategic position, that is, its dominant position in exports. It is important to reduce the costs of corn production, by increasing productivity, as well as to improve the quality of this product, through better quality seeds that should be used during sowing and later by applying more efficient agrotechnical measures in its production. The role of the government is also very important here, because the government must participate more significantly in the agricultural policy with incentive measures. Also, one should take into account the prices of imported products that are imported at higher prices compared to exported ones.

By processing primary agricultural products, Serbia can increase the value added and export of those products. Increasing productivity and efficiency in production, applying knowledge, technologies and experiences can lead to the improvement of product quality and strengthening competitiveness. Competitiveness is the basis for success and survival at the local level, and especially on the international market. Competition encourages production of high quality agricultural products and reduction of costs compared to competitors. The factors

of competitiveness are numerous, and emphasis is increasingly placed on the quality of products and services, quality standards, product safety and environmental protection.

Product quality and the introduction of the green economy have a positive impact on competitiveness and environmental protection (Bejtović et al., 2022). In order to produce better quality products, manufacturers need to develop new products and new technologies, in order to obtain high quality final products. High quality is already achieved by exporting frozen raspberries and other fruits from Serbia; however, it is necessary to achieve a higher level of fruit processing, in order to increase profits, etc. Also, it is necessary to encourage the development of livestock, in order to develop a wider range of quality meat and meat products, especially products with a geographical origin label, which enable a significant increase in exports. Agricultural production in Serbia is still not sufficiently focused on the optimal use of available capacities, increasing production, as well as changes of production structure towards finalization and high-quality products. The slowing down of technological restructuring, the growth of productivity and efficiency in agriculture is conditioned by the lack of new knowledge and technologies. With new technology and knowledge, it is possible to use resources more rationally and increase product quality and productivity, and therefore competitiveness on the market (Milojević et al., 2011).

In the fruit production of the Republic of Serbia, the most important fruit species are plums, apples and cherries, both in terms of the number of bearing trees and the production achieved, but raspberries are also very important. In the Republic of Serbia, due to favorable climatic and soil conditions, there is potential for the development and further improvement of fruit production, especially on family farms. Fruit farming, as an important field of plant production, is based on a number of comparative advantages in relation to other branches of agriculture, so that is why more attention should be paid to the production of fresh and processed fruit. Also, the adoption of quality standards is important for future progress in fruit production, as well as permanent support of the government, through incentives and integration within cooperatives and associations of fruit growers (Milić et al., 2011). The full potential of agriculture and fruit production has not yet been realized, although Serbia has favorable natural conditions for growing many fruit species. The largest volume of production of processed fruit products mainly refers to fruit juices and frozen fruit. Fruit juices and frozen fruit make over 90% of total processed fruit products. The fruit processing and cooling industry in the Republic of Serbia is often faced with the problem of insufficient capacity utilization. The volume of processing capacity is not always accompanied by the appropriate volume, quality and assortment of raw materials from agriculture (Lukač Bulatović et al., 2013).

The label "Serbian quality" is a national label used to mark agricultural and food products with special properties in the Republic of Serbia, with the aim of promoting higher product quality and the domestic origin of raw materials. The mark is a guarantee for consumers to buy a product of proven higher quality, which is produced from raw materials exclusively from the territory of the Republic of Serbia and which has specific characteristics that distinguish it from other products from the same food category (Ministry of Agriculture, Forestry and Water Management, 2020). The geographical origin (Table 8) is of particular importance when it comes to agricultural and food products.

Table 8 Geographical origin agri-food products, in 2020

No	Product with geographical indication	Type of label	Name of association/producer
1	Aril raspberry	Name of origin	Association "ARILL RASPBERRY ", Arilje
2	Djerdap honey	Geographical indication	Beekeeping Society "GOLUBAC'S CITY", Golubac
3	Homemade ajvar from Leskovac	Name of origin	Association "LESKOVAC'S AJVAR", Leskovac
4	Oblacinka from Oblacina	Name of origin	Association "OBLACIN'S CHERRY", Merosina
5	Pirot cheese made from cow's milk	Name of origin	Dairy School "Dr. Obren Pejic", Pirot
6	Kulen of Srem	Name of origin	"BUT&CO", Lacarak, Sremska Mitrovica
7	Fruskogorsk lime honey	Name of origin	Association of beekeepers "JOVAN ZIVANOVIC", Novi Sad
8	Futo fresh and sauerkraut	Name of origin	Association of producers and processors of futo cabbage " FUTO CABBAGE ", Futog
9	Homolj honey	Name of origin	Beekeeping cooperative "HOMOLJE MED", Žagubica

Source: Ministry of Agriculture, Forestry and Water Management, 2020

The concept of traditional and geographically indicated agricultural products is gaining importance due to the increasing desire of consumers to consume quality food (Užar, 2022). Also, consumers' decision depends on product and brand quality (Rita Inoni & Okorie, 2022). Bearing in mind the above, as well as a series of earlier research on the quality of agricultural and food products, it can be concluded that the Republic of Serbia should focus significantly more on quality agricultural products with protected geographical origin, which makes them recognizable on the world market, especially on the market of the most important agri-food foreign trade partners, such as the EU as a whole, in particular Germany and Italy, both the EU members, as the most important foreign trade countries for agri-food export from Serbia, as well as the country in the region (Bosnia & Herzegovina).

Further development of the agri-food sector will depend on the possibility of increasing its competitiveness, especially the requirements for food quality and safety (Matkovski et al., 2017). The space for competitiveness growth is found in significant natural resources that are still underutilized in agriculture, in the sphere of improving product quality standards, improving product assortment, introducing new types of production and innovations in the agri-food sector (Cvetković et al., 2017), that are very important for increasing competitiveness and achieving sustainable development (Cvetanović et al., 2016).

CONCLUSION

The Republic of Serbia has high-quality agricultural products, recognizable on the international market, such as frozen fruit and apples, the quality of which has a positive impact on the exports of the Republic of Serbia to the most important export markets. On the other hand, although it does not stand out especially for the quality of corn, which

statistically has a negative impact on the exports, the cereals sector and corn within that sector are strategically very important, especially since corn is exported in almost the biggest quantities of all agricultural products. However, the product quality, on the basis of which frozen fruit and apples are competitive at the world level, as well as the low price, on the basis of which corn achieves competitiveness, are not sufficient for that competitiveness to be achieved in the long-term. It is also necessary to innovate processing capacities, as well as to create a high-quality final product with value-added. Also, it is important to organize production and join together in clusters, in order to achieve greater bargaining power, as well as chances for financing.

The Republic of Serbia, from the aspect of agriculture, must encourage the maintenance and growth of competitiveness in the markets of the EU, which is the most important foreign trade partner for agri-food products, but also in the markets of other countries, which are also among the most important trading partners of the Republic of Serbia for agri-food products, i.e. in addition to the EU and the countries from the region, such as Bosnia and Herzegovina.

In addition to improving the quality of agricultural products, it is important to innovate the production process itself, as well as to process primary agricultural products into products of higher stages of processing, which can influence the increase in competitiveness and exports. This proved the hypothesis that the high quality agricultural products have positive impact on the export markets of the most important trade partners of the Republic of Serbia. Therefore, improving the quality of agricultural products has a positive impact on the growth of exports and the competitiveness of the agri-food sector.

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KVALITET POLJOPRIVREDNO-PREHRAMBENIH PROIZVODA KAO DETERMINANTA KONKURENTNOSTI IZVOZA REPUBLIKE SRBIJE

Kvalitet i bezbednost proizvoda predstavljaju bitne determinante konkurentnosti izvoza zemlje. Pitanja kvaliteta poljoprivredno-prehrambenih proizvoda sve više dobijaju na značaju, imajući u vidu savremene izazove i potrebe potrošača. Ovo pitanje je od posebnog značaja za zemlje u razvoju, pa i samu Republiku Srbiju, imajući u vidu značaj ovog sektora za izvoz i celokupni privredni razvoj. S druge strane, upravo su ove zemlje u zaostatku za razvijenim zemljama po standardima kvaliteta, s obzirom na skupe postupke sertifikacije i standrdizacije kvaliteta. Shodno tome, rast konkurentnosti treba postići kroz poboljšanje standarda kvaliteta proizvoda, unapređenje asortimana proizvoda i brži prodor inovacija u poljoprivredno-prehrambeni sektor. Cilj istraživanja je da se ispita kvalitet najznačajnijih izvoznih poljoprivredno-prehrambenih proizvoda Republike Srbije. Kao mera kvaliteta proizvoda, indeks

jedinične vrednosti (UV), je korišćen za analizu kvaliteta najvažnijih poljoprivredno-prehrambenih proizvoda na najvažnijim izvoznim tržištima, a na osnovu sekundarnih ITC podataka. Višestrukom regresijom je utvrđeno da poboljšanje kvaliteta ovih proizvoda ima pozitivan uticaj na rast izvoza i konkurentnosti poljoprivredno-prehrambenog sektora Republike Srbije. Naime, konkurentnost poljoprivredno-prehrambenog sektora zavisiće, pre svega, od sposobnosti ovog sektora da odgovori na zahteve povezane sa standardima bezbednosti i kvaliteta hrane, kao i mogućnosti ulaganja i inoviranja prerađivačkih kapaciteta, kako bi se stvorio kvalitetan finalni proizvod sa visokom dodatom vrednošću.

Ključne reči: *kvalitet, UV indeks (indeks jediničnih vrednosti), konkurentnost, izvoz, poljoprivredno-prehrambeni sektor*

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THE RELATIONSHIP ANALYSIS BETWEEN ENVIRONMENTAL PERFORMANCE AND ECONOMIC VALUE OF THE COMPANY

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Abstract. *The importance of environmental sustainability is becoming greater due to its contribution to greater value for customers and convergence of the circular economy and Industry 4.0, which can improve the efficiency of limited resource use. Based on the information from environmental accounting, managers can more effectively assess the economic impacts that corporate environmental performance generates on the company's operations. Environmental performance can be improved by developing new products and production processes in order to minimize the potential negative environmental impact. Many companies have introduced the practice of corporate self-regulation, which includes environmental management systems and reporting on the company's non-financial performance. The obtained results of the conducted empirical research could help managers make optimal decisions at the right time, and perform effective monitoring and rank of environmental and economic business indicators during the time.*

Key words: *Environmental Economics, Recycled waste, Gross Income, Food and Beverage Industry, Corporate Social Responsibility*

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1. INTRODUCTION

Strict environmental regulations and growing international concerns about global warming have influenced manufacturing companies to increasingly focus on reducing the

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impact of production processes on the environment. Also, the importance of environmental sustainability is becoming greater due to the convergence of the circular economy and Industry 4.0, which aims to improve the efficiency of resource use (Bonilla et al., 2018; Kiel et al., 2017). Stakeholder relations in an increasingly interconnected global world are being redefined into relations based on sustainability.

Ecological sustainability, as one of the basic principles of sustainability, implies that the pursuit of meeting our needs should not threaten the quality of the environment, while future generations should have a healthy and sustainable ecosystem (Liu et.al., 2019). The constant increase in pollution and the degradation of resources lead to environmental protection becoming an ultimatum, which causes the maximum attention of business systems and governments of countries around the global world. Consequently, there are increasing efforts to adopt environmentally sustainable practices, which will contribute to creating greater value for customers, improving brand image and satisfying the interests of various stakeholders. As organizations adopt digital transformation strategies, environmentally sustainable practices can trigger the development of new business models (Feroz et al., 2021).

Environmental managers, based on the information they receive from environmental accounting, can more effectively assess the economic impacts that corporate environmental performance generates on the company's operations (Stevanović et al., 2012). The company's environmental performance can be improved by developing new products and production processes by applying modern achievements of the scientific and technical process, all with the aim of minimizing the potential negative environmental impact. Viewed from that aspect, for the environmental manager, environmental accounting is a source of financial data on technical-technological improvements within the company that have certain implications for its environmental performance.

Food and beverage industry is needed for economic growth and development of every economy, and represents one of the biggest and most influential industries in the world. This industry is distinguished by the closest ties to the community because the goods and services that it created are seen as essential, in the sense that industry output cannot be curtailed, replaced, or abolished. It is necessary for humankind survival and development. This industry tracks population growth and the amount of people's spending power. It is believed that as the food and beverage industry expand, the amount of waste will similarly rise in bulk. This raises significant questions about the sustainability of this industry.

Issues of sustainability in the food and beverage industry have attracted public attention for a long time. In the last decade, the emphasis has been placed on the sustainable operation of this industry, with a special focus on the circular economy, ethical and responsible behavior towards the environment. For the modern food and beverage industry, socially responsible business is of particular importance in order to meet the increasing demands of consumers in terms of product quality and environmental impact. There is an increased demand for better performance and quality of industrial products, greater safety and lower energy consumption, and at a lower price with as little environmental impact as possible.

The relationship between environmental performance and economic value of the Coca-Cola Company is considered in this paper. Accordingly, after the introductory considerations, the second part of the paper is devoted to some open sustainability questions of the food and beverage industry: review of the environmental impacts and importance of corporate socially responsible practice. The third part of the paper represents ecologically sustainable business of the Coca-Cola HBC Serbia; it highlights some key aspects of corporate social responsibility, and gives overview of the environmental policy activities of the company. In the fourth part of

the paper, the results of the empirical research on the relationship between environmental performance and economic value of the company are presented. The paper ends with the conclusion section.

2. Some Open Sustainability Questions of the Food and Beverage Industry: Review of the Environmental Impacts and Importance of Corporate Socially Responsible Practice

The world is seeing unprecedented levels of environmental change, which has led to new problems. Biodiversity loss and global warming are the most severe environmental consequences of developed nations' decades-long intense exploitation of natural resource stocks and ecosystem degradation to support rapid economic development. Recently, emerging and developing economies have mirrored this trend, but at a considerably faster pace, largely due to the increasing the number of populations, and middle-class consumers, acceptance of the consumption model of developed countries; enormous financial flows pursuing scarcer energy and raw resources; unprecedented shifts in economic power between advanced to emerging and developing economies; and, delocalization of manufacturing (Chen et.al., 2021).

Putting under control harmful repercussions of non- sustainable behavior on the planet and humanity have been long recognized as a way to minimize harmful environmental effects by the state regulators. Although the basic task of the government is reflected in the formulation of effective environmental protection policies, and the monitoring of the realization of defined sustainable development goals, the ecological sustainability of development is not only their responsibility. Today, the private sector plays a major role in that process, bearing the responsibility for incorporating ecological principles into practice and creating a sustainable business culture.

In an effort to meet social demands for environmental protection, many companies have introduced the practice of corporate self-regulation, which, in addition to implementing environmental management systems, also includes reporting on the company's non-financial performance. The adoption and implementation of an environmental management system, certified according to one of the two internationally accepted standards ISO 14001 and EMAS, is a good way to identify and control environmental risk, but the biggest advantage of its introduction is reflected in the reduction of costs through more efficient use of resources and energy. Providing timely, consistent and truthful information in reports on the company's environmental performance contributes to increasing the transparency of activities and has a significant role in increasing the company's credibility, as well as improving dialogue with shareholders and competent state authorities. Seen from the aspect of environmental policy, the transparency of a company's activities affects the improvement of its environmental performance and enables savings in costs and resource use. In this way, the potential negative environmental impact is minimized.

In the context of the global economy, food is key to consumer confidence, global peace, and personal sustenance. So, maintaining the movement of food through the global supply chain is essential for sustaining life (Telukdarie, Munsamy & Mohlala, 2020)

Due to the wide variety of goods and manufacturing techniques, as well as the scale of the companies and production facilities, the food and beverage industry presents an extremely diversified industry. The practical experience indicates that the food and beverage industry is

highly dependent on natural resources, and has a potential huge adverse effect on the environment. Introduction of cleaner production practices might help to offset harmful environmental effects such the decrease of the water footprint and energy losses.

Environmental impacts of food and beverage manufacturing industry can be classified into two types and presented as shown in Table 1 and Table 2 (Dri, Antonopoulos, Canfora & Gaudillat, 2015).

Table 1 Direct environmental impacts of food and beverage industry

Inputs	Energy consumption	"Energy for the operation of processing machinery (pumps, ventilation, mixers, compressors, refrigeration and cooling units). Fuel consumption for own transport fleet. Energy for space heating and high temperature processes (boiling, drying, pasteurization and evaporation)".
	Water consumption	"Water consumption for cleaning operations. Water use as an ingredient, especially for non-alcoholic and alcoholic drinks. Process-related water consumption (e.g. for washing, boiling, steaming, cooling)".
	Use of chemicals	"Use of cleaning and disinfection agents. Use of refrigerants. Additives."
Outputs	Air emissions	"Dust, VOCs, refrigerants, emissions from combustion (such as CO_2, NOX and SO_2)".
	Solid waste generation	"Non-hazardous waste from manufacturing and processing (organic residues, sludge, waste packaging, etc.). Hazardous waste from the maintenance of equipment and machinery (packaging containing residues of / or contaminated by dangerous substances, absorbents, filter materials, oil filters, etc.)".
	Waste water generation	"Process water (from washing, boiling, evaporation, extraction, filtration, etc.). Water from cleaning operations. Service water (cooling water, boiler blowdown, regeneration exchangers, etc.). Sanitary water".
	Noise generation	"Noise from the operation of plant, machinery and equipment".
	Odors generation	"Odor losses during storage, filling and emptying of bulk tanks and silos".

Source: Authors' presentation based on Dri, Antonopoulos, Canfora & Gaudillat, 2015.

Direct environmental impacts are related to the internal activities of a food or beverage manufacturer, such as companies' operations, goods, and services (over which it has direct management control). Indirect environmental impacts that can be altered to some extent by the companies' engagement with third parties, and these actions are included in the manufacturing process of a manufacturer of food or beverages and are part of the value chain.

Having in mind these environmental impacts, consumers, nonprofit organizations, governments, and other stakeholders are putting greater pressure on the food and beverage manufacturing industry to enhance its sustainability performances throughout its operations and supply chains.

Table 2 Indirect environmental impacts of food and beverage industry

Inputs	Energy consumption	"Fuel consumption for transport. Energy used by consumers for food preparation".
	Resource depletion	"Materials used for packaging production".
	Water consumption	"Water use in agriculture".
	Biodiversity loss	"Loss of biodiversity due to agricultural activities".
Outputs	Air emissions	"CO2, NOX and SO2 from transport. Emissions from industrial production of packaging, raw materials, auxiliaries. Greenhouse gas emissions from primary crop and animal production".
	Solid waste generation	"Food waste (households, wholesale/retail and food service). Packaging waste".

Source: Authors' presentation based on Dri, Antonopoulos, Canfora & Gaudillat, 2015.

Applying sustainability practices not only "improves a company's and its supply chain's environmental and social performance, but it also allows them to gain a new set of capabilities that can give them a competitive edge by pursuing sustainability activities both within and outside of their boundaries" (Saeed & Kersten, 2019). Accordingly, corporate social responsibility (CSR) represents one of the bases for understanding corporate sustainable development.

CSR has drawn a lot of interest from scholars with a variety of disciplines across the globe, and it has gained significant attention in the previous 20 years. As a consequence, „corporate social responsibility" is receiving increasing attention from academics, government officials, and business leaders.

The concept of corporate social responsibility has several different connotations, including corporate sustainability, corporate citizenship, and social responsibility. In its very beginning, CSR was presented as the required behaviors in light of societal ideals and objectives (Bowen, 1953). Similarly, the concept can be understood in such a manner that it points out that business actions have social implications, so the corporations must make business decisions taking into account societal interests as a whole, and cannot solely concentrate on the economic interests (Davis, 1960). The reason for this is the fact that businesses that overlook social responsibility may inevitably lose market share and income.

Frederick (1960) grasped the need to balance societal goals with economic ones in order for both production and distribution to be in line with socioeconomic well-being. Also, as businesses have social obligations to society in addition to their legal and financial duties (McGuire, 1963), the core of social responsibility is the relationship between enterprises and society (Walton, 1967). Milton Friedman (1970) held the view that, in a free market with open competition, the sole goal of a company's social responsibility should be profit maximization. Therefore, social activity is only appropriate when it benefits the needs of the company.

Therefore, it could be noted that in its origin the concept of CSR guarantees that the business can expand sustainably (Sharma, Sharma & Devi, 2011), in a way that implies adaptation to the environmental and social requirements of various interest groups (Miller & Guthrie, 2007).

Numerous definitions and interpretations of the concept of corporate social responsibility can be found in the literature, so "there is neither a general consensus nor a universal agreement on the definition of CSR nor a range of its main aspects" (Ounane & Yahiaoui, 2018, pp.192). The Dow Jones Sustainability Index's (DJSI) general definition

of CSR is as follows: "CSR is a business approach that creates long-term shareholder value by embracing opportunities and managing risks deriving from economic, environmental and social developments. CSR leaders achieve long-term shareholder value by gearing their strategies and management to harness the market's potential for sustainability products and services while at the same time successfully reducing and avoiding sustainability costs and risks."

The concept of CSR can be understood as corporate and stakeholder efforts that contribute to the long-term balance in triple bottom line perspectives and their interplay in sustainable company activities (Tseng et al. 2021). As a corporate operation with an emphasis on applying processes to firms and their stakeholders, triple bottom line is a key component of CSR. The triple bottom line has a key role in in corporate sustainability since it can have an impact on raising profitability, reducing waste, and delivering customer satisfaction. Consequently, CSR is aimed at establishing sustainability equilibrium, e.g. to precise equilibrium of human needs with the health of the environment and the economy (Saunila et al.).

Socially responsible practice is an intangible asset that has a strategic importance for the company in terms of realization of the competitive advantage, improvement of the company's reputation and image, and its credibility in the market. Sustainable behavior implies innovation whose realization can contribute to lower input demand, lower costs, and the opportunity to generate new products that can leads to higher income.

However, some authors (Hartmann, 2011) emphasize that the food and beverage industry is faced with some obstacles in achieving socially responsible practice, such as: (1) "reliance on natural, physical, and human resources; (2) public concern and demand for the manufacturing process and raw material production (if organic food is utilized, animal welfare is guaranteed, the company uses sustainable energies, and trash is disposed of properly); (3) disputes within the industry, given that it has a complicated organizational structure and includes businesses of various sizes that have varied approaches to corporate social responsibility".

Also, there is a high possibility that the food and beverage industry will face a public reaction over problems of corporate social responsibility (Maloni & Brown, 2006). Such complaints focus on the company's lack of social responsibility initiatives, which may jeopardize its profitability and long-term existence. Typical examples are Nestlé and Coca-Cola (Hartmann, 2011), that were in the past operating in developing countries' subsidiaries under unfavorable working circumstances and by engaging in environmentally responsible behavior, they have suffered bad publicity. Also, campaigners have started to boycott the goods made by these corporations due to the low quality of the goods supplied in these nations.

Companies are increasingly using voluntary codes of conduct aimed at encouraging social and environmental efforts, as public criticism is not restricted to the company's internal behaviour, but to the entire industry's supply chain. The food and beverage business increasingly participates in social responsibility activities in response to the growing public perception of corporate social policies.

Due to the high level of consumer recognition that brands enjoy in comparison to other sectors of the economy, the close proximity of the final product to the consumer, and all the social and environmental impacts attributed to these companies, social responsibility worries in the food industry relate to the growing consumer value placed

on food safety in production and supervision as opposed to the risk of illness and even death.

Thus, realizing the importance of connecting the socialy responsibile practices and the mission and vision of the company, the development and implementation of projects and programs that can contribute to improving the welfare of all stakeholders, the introduction of behavioral standards through the code of conduct, and the disclosure of sustainability reports, the companies that operate in the food and beverage industry increasingly consider these aspects strategically important for the improvement of economic performance aspects.

3. Ecologically Sustainable Business of the Coca-Cola HBC Serbia Company

3.1. Key aspects of corporate social responsibility

Coca-Cola HBC Group's business is focused on the production and sale of beverages in the consumer goods segment, with a focus on growth and cooperation with customers. "Annual sales of Coca-Cola HBC Group amount to over 2,000,000,000 units. Coca-Cola HBC operates in 28 countries, has 56 bottling plants, 98 distribution centers, 17,000 suppliers, more than 1,600,000 customers, and its products reach 618,000,000 people on three continents. The group directly employs 27,722 people, and indirectly provides 374,222 jobs" (Coca-Cola HBC Serbia, 2020, p. 7).

The Coca-Cola Company, whose shares are at the top of the London Stock Exchange, which testifies to its financial strength, also achieves enviable results in the area of social responsibility. Thus, according to the criteria of the Dow Jones Sustainability Index, Coca-Cola HBC Group was ranked as the most sustainable beverage producer in the world in 2021. In the last seven years, Coca-Cola HBC Group has been recognized as a global leader in the beverage industry for the fifth time, and for the tenth year in a row as one of the three best-ranked companies.

Coca-Cola HBC Serbia, as a system consisting of the Coca-Cola Company and Coca-Cola HBC Serbia, has been present on the Serbian market since 1997. Coca-Cola HBC Serbia consists of a bottling plant in Zemun with a regional juice center and factory in Vlasinka and three distribution centers. The company cooperates with over 37,000 customers and over 1,700 suppliers.

By operating on the Serbian market, one of the most active and successful business systems has been developed, as well as a reliable partner of the local community. In this regard, the company undertakes activities in the direction of achieving business sustainability goals. These goals are an integral part of the mission and vision of the parent company in accordance with the global agenda of the Coca-Cola Company for the year 2030 ”World without waste”. Also, Coca-Cola HBC Serbia is a strategic partner of the Coca-Cola Company.

Many aspects of sustainability are an integral part of Coca-Cola's business. These include sustainable water use, sustainable packaging, climate protection, human and labor rights, women's rights, community well-being and sustainable agriculture. These efforts are an integral part of the company's business policy, as evidenced by numerous projects and initiatives undertaken by the company's management, which include the following (Coca-Cola HBC Serbia, 2020, p. 41):

1. “The Coca-Cola Company began its partnership with the Red Cross in 1917. This partnership continues to this day and is essential to the company's involvement in emergency relief;

2. Lettie Pate Evans joined the board of directors in 1935 as the first woman on the board of a major company;

3. The first diet drink, Tab, was produced by Coca-Cola in 1963. Tab was introduced before the early growth of the low-calorie soft drink segment, and the drink was developed for consumers who wanted to "watch their calories";

4. In 1966, the company launched its first "Nutrition Project", with the aim of finding a solution for the so-called "protein gap" faced by the world's impoverished nations and the provision of more protein-rich soft drinks. As a result of this project, the brands of three protein-rich energy drinks, Saci, Sanson and Tai, developed in Latin America, which use local ingredients, such as soy and whey as a source of protein for the drinks;

5. With the founding of the Coca-Cola Foundation in 1984, the company committed to allocating 1% of its annual income to solving key problems in three areas: protection of the position of women, water protection and well-being;

6. In 2007, the company founded the Coca-Cola Africa Foundation, which worked on the prevention and treatment of HIV/AIDS in Africa, all with the aim of promoting human health. Since its inception, the Coca-Cola Africa Foundation has launched numerous projects and initiatives across Africa;

7. In 2007, the company announced a transformational partnership with the World Wide Fund for Nature (WWF) to address freshwater conservation challenges;

8. In 2009, the company introduced Plant Bottle Packaging, the first recyclable PET plastic beverage bottle made 30% from plants. The company has continued to develop sustainable packaging, including creating the world's first prototype PET bottle made entirely from plant-based materials in 2015;

9. In 2020, the company launched the 5by20 Initiative, with the aim of acting as a reliable partner of the local community. In this regard, the company undertakes economically empowering 5 million female entrepreneurs around the world. Through the initiative, women are offered access to business skills courses, financial services and connections with colleagues or mentors;

10. The company founded the first ECOCENTER in 2013. EKOCENTER is a modular community marketplace run by local women entrepreneurs that provides safe drinking water, wireless communication, electricity and other functionalities to accelerate entrepreneurial opportunities and community development”.

Coca-Cola HBC Serbia is committed to responsible behavior towards the environment. Environmental impact management, i.e., identification and assessment of environmental impacts, as well as improvements in terms of protection and monitoring of the achievement of environmental goals, are an integral part of the company's operations.

The company, at the level of the Group, with the new sustainability goals until 2025, has committed itself to achieving the following 17 goals in six priority areas to 2017 as the base year, namely: reduction of emissions, water consumption and management, a world without waste, responsible supply, nutrition and community (Coca-Cola HBC Serbia, 2020). In the area of emissions reduction, Coca-Cola HBC Group, in accordance with its sustainability goals by 2020, has committed to reducing the intensity of direct carbon emissions by 50%, as well as reducing carbon emissions in the value chain by 25 percent.

Given that packaging is one of the most important factors in maintaining the quality and safety of the company's products, and bearing in mind that this aspect of the business has significant impacts on the environment, the company continuously strives to close the recycling cycle, converting already used packaging into new. In addition, the development of packaging that has less weight and the reduction of the amount of waste, as well as the increase in the content of recycled and renewable material in the composition of new packaging, constitute a set of new activities of the company. All this is achieved by taking actions to facilitate and optimize packaging.

The World Wide Fund for Nature (WWF-CEE) and the Coca-Cola Foundation are working to further develop their unique partnership for large-scale river and wetland restoration in the Danube River Basin. Wetlands cover about 6% of the surface of the planet Earth, with 87% of the area lost in the last 300 years. Wetlands are now disappearing three times faster than forests, thus putting the plant and animal species that live there in danger of extinction. More than 80% of the wetlands in the Danube basin have been lost in the last 150 years, and with them all the benefits of the ecosystem. Lost wetlands affect: declining fish and wildlife populations, reducing water quality, and jeopardizing needed biodiversity. At the same time, it is known that wetlands act as a buffer for flood waters and are becoming more and more valuable in the face of climate change.

In 2021, WWF-CEE, the Coca-Cola Foundation and the International Commission for the Protection of the Danube River (ICPDR) successfully completed the first phase of an intersectoral partnership to promote the protection and restoration of wetlands in the Danube River Basin. With its participation of 4.4 million dollars, the Coca-Cola Foundation supported the eight-year Partnership for the Living Danube, and thus contributed to the restoration of vital wetlands, rivers and floodplains along the Danube River and its tributaries, thereby increasing the capacity of the river itself. The Partnership for the Living Danube has restored over 5,462 hectares of wetlands, an area larger than 7,422 football fields. In this way, the capacity of the Danube was increased by 13 million m3, which is equivalent to a volume greater than 4,800 Olympic swimming pools.

3.2. The environmental policy activities of the company

The Coca-Cola Company is aware of how important it is for the system as a whole to maintain a sustainable and healthy environment. This conviction is ingrained in the Company’s business vision and supports its mission to improve the world.

The goal of the Company is to develop the brands and beverage options that people like, to revitalize them physically and mentally in such way that builds a more sustainable company and a better future for all.

The Company management should run the company in a way that minimizes the impact on the environment while protecting and preserving it. Working with carefully chosen vendors and business partners who are steadfastly dedicated to the management of sustainable operations and procedures is part of this.

In order to achieve this goal, the Company’s activities are directed towards the following environmentally significant areas:

Improve water security in the areas where the Company operates, obtain ingredients, and interact with people; continually increase the effectiveness of water use in the operations, assist in addressing common water issues to develop more durable ecosystems; and by promoting ecologically friendly practices.

In order to contribute to the global efforts in the field of climate protection, Company's activities are directed towards reducing carbon emissions throughout the supply chain, reaching net zero emissions by 2050; and using sources of renewable energy, increasing energy efficiency, waste reduction, and using innovative equipment.

In order to fulfill the Company vision of waste-free future, the packaging will be recycled and innovatively used to create new packaging in a circular economy. The Company introduced the World Without Waste program in 2018, and as part of it, it seeks to promote recycling and packaging collection, increase the usage of recycled materials, and bring partners and customers together to support a clean, healthy environment.

The Coca-Cola Company is committed to acquiring its agricultural ingredients in a way that is more morally and environmentally responsible. So sustainable sourcing, as one the most urgent environmental initiatives of the Company, is grounded on the first principles for sustainable agriculture based on environmental, social, and economic factors as described in The Principles for Sustainable Agriculture (PSA), the follow-up to the Sustainable Agriculture Guiding Principles (SAGP).

The above targets' achievements are presented annually in Company's Business & Environmental, Social, and Governance Report, which demonstrates its ongoing efforts to integrate sustainable business practices into core strategy.

4. EMPIRICAL RESULTS

In order to empirically test the research assumptions about the relationship between environmental performance and the economic value of the company, a multi-criteria analysis was applied to a set of selected indicators of economic (*gross income* and *amount of recycled material*) and environmental performance (*total water consumption*, *material use*, *total energy consumption*, *amount of production waste*, *CO_2 emissions*) of Coca-Cola HBC Serbia in the period from 2013-2021.

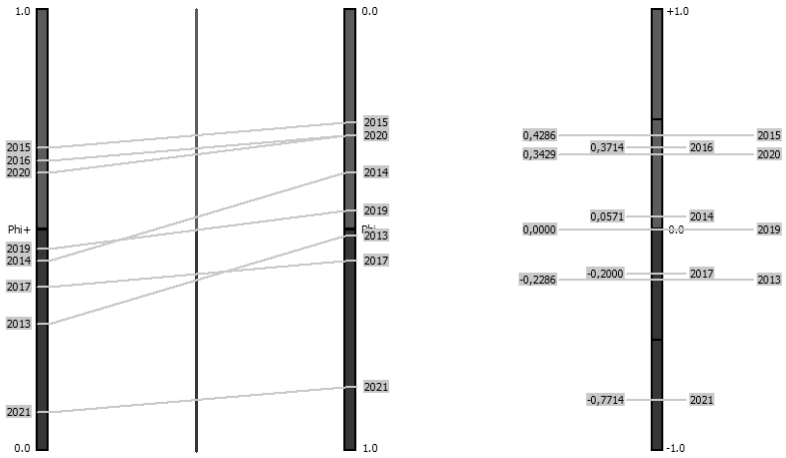

Fig. 1 PROMETHEE I Partial Ranking and PROMETHEE II Complete Ranking
Source: Authors

Based on the obtained results, it can be seen that the total consumption of water, the use of materials, the total consumption of energy, the amount of production waste, the emission of CO_2 is the highest in 2015, while the lowest consumption was achieved in 2021. Figure 1 shows PROMETHEE I Partial Ranking and PROMETHEE II Complete Ranking of the included environmental indicators. This analysis suggests and helps decision makers to focus on the causes that may have led to certain results by age.

On the other hand, by applying the *Visual Promethee Academic* multi-criteria decision-making software, the business performance of the analyzed company was ranked by year in the period from 2013 to 2021. Figure 2 shows the Input-Output Efficiency analysis, which suggests that the highest economic value, measured by the realized gross income and the amount of recycled material, was achieved in the last analyzed year (2021). The realized value is the result of the numerous activities that company undertook in previous years in the field of corporate social responsibility.

Based on the displayed results, the direction of the relationship between environmental performance (t*otal water consumption, material use, total energy consumption, amount of production waste, CO_2 emissions*) and economic value of the company (*gross income, amount of recycled waste*) can be determined. Namely, in the last observed year, when the company Coca-Cola HBC Serbia achieved the most favorable environmental performance, the highest economic value of the company was recorded.

Figure 3 presents GAIA Visual Analysis which is a multidimensional representation of the decision problem with as many dimensions as the number of criteria (seven in this analysis). A mathematical method called the Principal Components Analysis is used to reduce the number of dimensions while minimizing the loss of information.

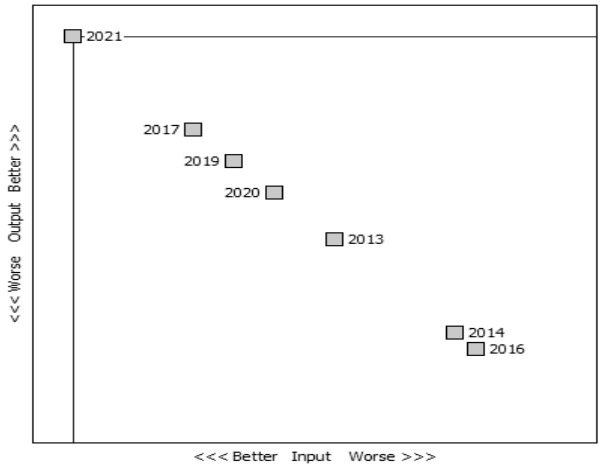

Fig. 2 Input-Output Efficiency: gross income and production waste
Source: Authors

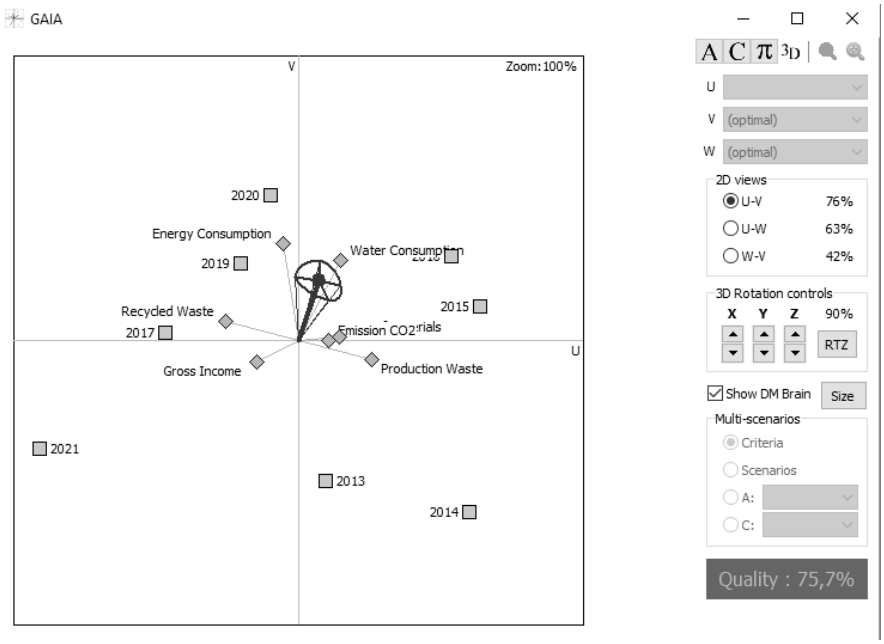

Fig. 3 GAIA Visual Analysis
Source: Authors

In Visual PROMETHEE three dimensions are computed:

- U is the first principal component, it contains the maximum possible quantity of information,
- V is the second principal component, providing the maximum additional information orthogonal to U,
- W is the third principal component, providing the maximum additional information orthogonal to both U and V.

In practice the 2D GAIA analysis is reliable when the quality level is above or close to 70%. The orientation of a criterion axis indicates where the best actions for this criterion are located. Figure 3 shows that water consumption was the lowest in 2016; we had the lowest CO2 emissions in 2015; the lowest energy consumption was recorded in 2020; the lowest amount of production waste was during 2013 and 2014, while the highest economic value measured by gross income was achieved in 2021.

In this way, the basis for further research in this area was created, and the applied methodology can basically be applied in other industries as well. Future research can focus on the consumption behavior in the food and beverage industry, and the costs of the recycling process that companies incur when implementing this strategy.

5. CONCLUSIONS

Environmental economics, which is based on the neoclassical model and emphasis on negative externalities, is the study of the cost-effective allocation, use, and protection of

the world's natural resources. A major subject of environmental economics are the additional costs of doing business that are not paid by the business or its consumers. Putting under control harmful repercussions of non- sustainable behavior on the planet and humanity have been long recognized as a way to minimize harmful environmental effects by the state regulators. Although the basic task of the government is reflected in the formulation of effective environmental protection policies, and the monitoring of the realization of defined sustainable development goals, the ecological sustainability of development is not only their responsibility. Today, the private sector plays a major role in that process, bearing the responsibility for incorporating ecological principles into practice and creating a sustainable business culture.

From the aspect of environmental policy, the transparency of a company's activities can improve environmental performance and enable savings in costs and resource use. Hence, the potential negative environmental impact is minimized.

Due to the wide variety of goods and manufacturing techniques, as well as the scale of the companies and production facilities, the food and beverage industry presents an extremely diversified industry. In addition, the food and beverage industry is highly dependent on natural resources, and has a potentially huge adverse effect on the environment. Introduction of cleaner production practices can help to offset harmful environmental effects such the decrease of the water footprint and energy losses. Direct environmental impacts are related to the internal activities of a food or beverage manufacturer, such as companies' operations, goods, and services (over which it has direct management control). Indirect environmental impacts that can be altered to some extent by the companies' engagement with third parties, and these actions are included in the manufacturing process of a manufacturer of food or beverages and are part of the value chain.

The Visual Promethee Academic multi-criteria decision-making software was applied in the paper in order to rank selected business performance of the analyzed company by year, in the period from 2013 to 2021. Based on the PROMETHEE I Partial Ranking and PROMETHEE II Complete Ranking of the included environmental indicators. it can be concluded that the total consumption of water, the use of materials, the total consumption of energy, the amount of production waste, and the emission of CO_2 is the highest in 2015. Also, when the company Coca-Cola HBC Serbia achieved the most favorable environmental performance, the highest economic value of the company was recorded. In addition, Input-Output Efficiency analysis suggests that the highest economic value, measured by the realized gross income and the amount of recycled material, was achieved in 2021. The realized value is the result of the numerous activities that company undertook in previous years in the field of corporate social responsibility. This analysis could help environmental and financial managers make optimal decisions at the right time, and perform effective monitoring of environmental and economic business indicators.

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ANALIZA ODNOSA IZMEĐU EKOLOŠKIH PERFORMANSI I EKONOMSKE VREDNOSTI KOMPANIJE

Značaj održive životne sredine postaje sve veći jer doprinosi stvaranju veće vrednosti za kupce i konvergenciji cirkularne ekonomije i Industrije 4.0, što može poboljšati efikasnost korišćenja ograničenih resursa. Na osnovu informacija iz računovodstva životne sredine, menadžeri mogu efikasnije proceniti ekonomske uticaje koji ekološki učinak generiše tokom poslovanja. Ekološki učinak može se poboljšati razvojem novih proizvoda i proizvodnih procesa kako bi se minimizirao potencijalni negativni uticaj na životnu sredinu. Mnoge kompanije su uvele praksu korporativne samoregulacije, koja uključuje sisteme upravljanja životnom sredinom i izveštavanje o nefinansijskom učinku kompanije. Dobijeni rezultati sprovedenog empirijskog istraživanja bi mogli da pomognu menadžerima da donese optimalne odluke u pravo vreme, i da tokom vremena izvrše efikasan monitoring i rangiranje ekoloških i ekonomskih pokazatelja poslovanja.

Ključne reči: *ekonomija životne sredine, recikliranje otpada, bruto prihod, industrija hrane i pića, društveno odgovorno poslovanje*

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Original Scientific Paper

THE INFLUENCE OF RESEARCH AND DEVELOPMENT AND PATENT ACTIVITY ON BUSINESS PERFORMANCE: THE CASE OF HIGH-TECHNOLOGY COMPANIES

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Abstract. *The purpose of the work is to determine the impact of R&D activities and patent activity on the business performance of high-tech companies with the largest number of patent applications according to the records of the World Intellectual Property Organization (WIPO).*
The research sample consists of 33 high-technology companies that were continuously on the WIPO's Top 50 PCT applicants list in the period from 2013 to 2020. Regression analyses have been performed to determine the impact of R&D activity and patent activity on the business performance of high-technology companies.
The research confirms the importance of R&D and patent activity for the business performance of high-technology companies. This study revealed that R&D investment, number of granted patents and published PCT applications have a positive influence on sales revenue, gross profit, operating profit, earnings before interest and taxes, earnings before interest, taxes, depreciation, and amortization, market capitalisation. The positive influence of patent activity indicators on return on equity is also present; however, the influence of R&D investment on return on equity is negative.
The research results have significant implications for R&D, intellectual property and corporate managers of high-tech companies in terms of significantly improving the efficiency of R&D investments and their impact on company's profitability. Also, there

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are significant implications related to improving the effectiveness of the innovation process and patent activity and their impact on other business performance.
The originality of this study is reflected in studying the influence of patent activity indicators on gross profit, earnings before interest and taxes, earnings before interest, taxes, depreciation, and amortization, and return on equity.

Key words: *R&D activity, patent activity, business performance, high-technology companies*

JEL Classification: O32, O34

INTRODUCTION

Nowadays, society and the economy are going through numerous and rapid changes that dictate the speed of their development. Adapting to those changes is a criterion for survival in the market. Earlier, with the industrial revolution, there were changes in productivity, which implied an increase in the productivity of the physical workforce. Today, the changes occurring in the market have a different character; they are based on the gaining of new competencies and their use through the differentiation of product development, production, services, and distribution. This means that today the focus is on knowledge resources i.e., the knowledge-based economy. In this sense, intellectual capital has an important role in achieving and maintaining competitiveness in the heated market competition.

It is important for various market participants to keep up with the competition or for those ambitious, potential market leaders, to be ahead of their competition. In order to achieve this, it is important that they possess knowledge that implies learning about something new, previously unknown to the competition, and with a perspective of success that always includes a certain level of risk. In conditions of intense competition and with ever shorter product life cycles, it is not easy for companies to maintain the continuity of their innovative activity. Also, apart from the continuity of innovative activity, it is necessary to achieve its optimal dynamics, because if innovations are implemented too quickly and multiple times, the company may have a problem of not being able to generate profit from its creative efforts and innovative solutions.

In order to obtain adequate knowledge, companies invest significantly in R&D. It is considered that R&D are the accelerator of the prosperity of modern society. R&D activities can improve companies' business performance (Rađenović et al., 2022). As a result of these activities, inventions that are the subject of patents are often created. Companies that own patents as a crucial element of their intellectual capital portfolio have specific strategies for using these elements of their portfolios, which imply the use of each individual patent in a certain way. Some of the patents they have can be beneficial for both company's performance and the country's macroeconomics performance where the company operates (Jovanović et al., 2022). Bearing in mind the importance of R&D activities, as well as patenting activity for the competitiveness of companies, and with a special emphasis on the importance of these activities when it comes to high-tech companies, the purpose of this study is to point out the importance that R&D activities and patenting have on business performance of high-tech companies. The goal of the work is to determine the impact of R&D and patent activities on the business success indicators of high-tech companies with the largest number of patent applications according to the records of the World Intellectual Property Organization (WIPO).

1. LITERATURE REVIEW

1.1. R&D activities and patenting as the driving force of high-tech companies' business performance

Given that high-tech companies operate in an environment that is determined by constant progress in technology and increasingly sophisticated consumer demands, high-tech companies must have the internal ability to generate new knowledge, as well as to know the way in which that knowledge can be used to create advantages on the market. R&D activities enable the companies to do so. "The annual research and development expenditures of a firm are considered to be investments which add to a firm's stock of knowledge" (Hall et al., 1986, p. 265). Investing in R&D makes it possible to use not only knowledge created within the company, but also knowledge obtained externally, from the environment. Depending on the ability of R&D activities to generate, obtain and use knowledge in an efficient and effective way, innovative output will be created. It is crucial to have a successful open innovation strategy that will increase the company's competitive advantage (Krstić & Jovanović, 2022). The ability to innovate one's own business is the fundamental competitive advantage of every modern company (Janjić & Rađenović, 2019).

Often, high-tech companies choose to protect their inventions with a patent as a form of intellectual property. They do this in order to prevent competition from using the invention and to maintain their monopolistic status in the market. In this way, they are enabled to make extra profit the whole time during the protection period of their invention that is provided by having a patent for that invention. Also, they can decide to license the patents they own and earn income in that way. It is also possible for them to use patents for strategic purposes. For example, they can keep them in their portfolio waiting for the right moment to use them for commercial purposes or to simply prevent competitors from exploiting the invention. Companies may define a broader scope of invention protection than necessary, in order to protect themselves from potential litigation for future innovations and to create barriers for rivals to commercialize their inventions (Blind et al., 2006; Blind et al., 2009). When it comes to high-tech companies, it is known that they allocate significant funds for R&D and that they have the reputation of being intensively innovative companies. Patents, as a form of intellectual property, have a large share in the intellectual capital portfolio of high-tech companies. That is why these companies should disclose intangible assets in an additional report, as well as patents as a particular position within intangible assets. In this way, they send a signal to the environment that their focus is on innovation activity, which has a positive effect on investors and increases the value of the company's goodwill.

Numerous authors have examined the impact that patents have on business performance. Some of them indicated a positive impact of patents on a company's performance (Cho and Pucik, 2005), while others denied the existence of any impact (MacDonald, 2004) or even claimed that there is a negative impact (Artz et al., 2010). In this paper, the starting point is that there is a positive influence of R&D activities on patent activity, and then a positive impact of patent activity on the vital success indicators of high-tech businesses that have the largest number of patent applications according to the records of the WIPO.

1.2. Indicators of R&D activity and patenting

When considering R&D activity indicators, the most commonly used in empirical studies is *R&D investment (RD)*.

R&D investment (RD) is a key factor of progress, innovation and economic performance. It is a determinant of growth in productivity and competitiveness and a factor of sustainable and economic development. Investments in research and development cover all activities in creating innovative goods and services up to the point of market success. (Wesley & Wonglimpiyarat, 2020, p. 5). Investments in R&D that improve technological potential, are necessary in order to improve innovation ability and capacity. R&D expenditures are one of the most important determinants of innovation performance (Wang et al., 2013; Hunady et al., 2020). However, R&D investments include certain risks because they cannot be precisely predicted if they would result in success or failure in the near and further future.

The important fact that should be considered when examining the effect of R&D on corporate performance is that there is a certain time lag. That is because R&D activities need some time before they will be manifested in the innovative and financial indicators of a company (Lee & Lee, 2007; Rao et al., 2013; Yun & Kim, 2021).

There are many patent activity indicators that have been used in different studies and empirical research which reflect how the patent activities influence corporate performance. However, the majority of the studies used the number of patent applications and the number of granted patents as representative indicators for measuring patent activity.

The number of patent applications is a criterion1 of patent activity that is frequently used as a parameter of patent activity. It is logical to expect that the amount of patent applications has a beneficial effect on firm performance, despite quality considerations. Large patent portfolios are a sign of increased R&D activity and, consequently, higher levels of innovation. Large patent portfolios can also be strategically advantageous, such as obstructing rivals (Blind et al. 2006). A larger patent portfolio can also be utilized to keep out smaller possible rivals from operating in specific industries as well as increase the probability of licensing agreements or other types of trade with other companies. Additionally, the bigger patent output might be viewed as a good sign for the market.

The number of granted patents is another parameter of patenting activity that could indicate its success. The clarification of this measure is very simple because it may be considered that the procedure of granting the patent itself determines the value of patenting activity. Due to the fact that a granted patent has satisfied the requirements of novelty, advancement in technology, and commercial viability, it can be considered to be more valuable than a non-granted patent.

In order to explore the effect of patenting on business success indicators, many researchers have been aware of the time lag period that exists between the moment the patent was granted and the time when its usage starts to affect the business performance of the company. Therefore, they carried out their research by taking this fact into account (such as Cardinal (2010)).

1.3. The relation between R&D activity and business performance through patenting as a moderator

There are many studies in which the indirect effect of R&D activity on business success indicators has been investigated through its effect on patenting activity.

Yun & Kim (2021) explored the function that patents play in various R&D innovation activities, together with the implications of R&D innovation activities on the corporate management performance of innovative small and medium-sized enterprises (SME) in South Korea. These firms worked on innovative technology initiatives. The data for a five-year period (2015–2019) underwent panel regression and moderating impact analyses. The

findings demonstrated a significant positive impact of R&D on operating profit and revenue. This suggests that these activities contribute positively to management efforts. Therefore, from the standpoint of a corporate growth plan, firms should think about innovation activities realised by R&D investment. The outcomes of the research also revealed a favourable moderating influence of a firm's ability to hold patents on the effect R&D innovation activities have on business management performance.

Xu et al. (2022) examined the effect of corporate R&D input on patent performance and company operating income using regression analysis. The wastewater treatment companies were chosen for the research sample and the examined period is from 2013 to 2020. The findings indicate that the positive impact of R&D on operating income is moderated by patent activities (Xu et al., 2022).

Paula & Silva Rocha (2021) examined the impact of internal R&D and patent applications on business success on a sample of 751 enterprises from six Latin American countries. Their research results indicate that internal R&D has a beneficial impact on a company's performance which is measured by turnover growth, while patents have a negative impact. Patents are also impacted by internal R&D. Therefore, internal R&D has a negative indirect effect on performance.

Many studies show a positive role that patents have when considering the R&D activity influence on business performance; however, there are some studies that show the opposite, such as the study of Lanjouw and Schankerman (2004). Using a patent quality index, Lanjouw and Schankerman (2004) were able to demonstrate a negative relationship between the productivity of research in the firm and the patent quality index, but also a positive relationship between research productivity and the value of patented innovations at the market.

1.4. The relation between patenting and business performance

Some academicians have claimed and practically proven that patents have a positive influence on business performance (Cho & Pucik, 2005), whereas some argue there is no correlation between them (MacDonald, 2004). Others claim that a negative impact between patenting activity and business performance exists (Artz et al., 2010).

In his research of the patenting practices of American manufacturing companies, Mansfield (1986) discovered that while patents were crucial to innovation performance in a few industries, such as chemicals and pharmaceuticals, they were comparatively insignificant in other industries, including electrical goods, primary metals, instruments etc. Hagedoorn and Cloodt (2003) discovered a correlation between business success and an indicator compound of R&D inputs, number of patents, patent citations, and new product announcements. Oh (2003) sampled and experimentally assessed 89 firms from an initial sample of the top 150 businesses with the highest number of registered patents from 1998 to 2002. The number of patent applications had an impact on corporate growth, and it was determined that the number of applications per employee had an effect on productivity, proving that the quantitative aspect of patents was an important factor in financial performance. Despite not directly examining any performance metrics, Mann and Sager (2007) discovered that patenting in small firms in the software industry is positively connected with their survival.

Scherer (1965) analysed the impact of patent registrations on revenue, sales growth, and profit rates of 365 businesses from the Fortune 500 list as the subject of his research. He established that there is a positive relationship between the number of patent registrations and

the rate of sales growth and that the rise in sales has a beneficial effect on profits. Comanor & Scherer (1969), in their study of 57 businesses from pharmaceutical industry in the U.S., found that sales were affected by both the number of patent applications and registrations, with the number of patent applications having a bigger effect. The study by Ernst (1995) examined how corporate success is related to "patent activity" and "quality level of patent technology" of corporations. The corporate performance index and the patent index were used to confirm the link between the two variables and showed there is a strong correlation between them.

According to research by Ernst (2001), patents are useful tools for securing technological innovations and have a favourable effect on firm sales. According to Nerkar and Roberts (2004), sales income is positively correlated with a company's stock of patents. Also, Lee & Yoon (2006) proved that the number of granted patents had a substantial impact on sales and net profit margins in a study of 100 firms by implementing regression analysis. Additionally, Czarnitzki and Kraft (2010) discovered that a company's patent stock had a significant and consistent impact on profitability in their examination of a sample of companies from manufacturing in Germany. In their research, Yang et al. (2021) examined the influence of characteristics of patents on the performance of corporate management of SMEs. The sample they analysed consisted of 278 SMEs. The results of their research indicate that the independent variables (number of patents and the average score of patents) are relevant for differentiating between corporates that experienced an average sales growth rate that was greater than twice as high as that of SMEs in general and those that experienced growth less than twice as high (Yang et al., 2021).

Griliches (1981) discovered a strong correlation between firm market value of large American companies and what he refers to as its "intangible" capital, which was measured by prior R&D spending and the number of patents. Pakes (1985) demonstrated in his study the positive effect of successful patent applications on the market value of the company. The valuation of large Australian companies was examined by Bosworth and Rogers (2001). According to their research, there is a positive and strong correlation between R&D and patent activity on the one hand, and market value on the other as determined by Tobin's q. Using patents and citations from 1963 to 1999, Hall et al. (2005) discovered a positive relationship between business market value and the ratios of R&D to assets stocks, patents to R&D, and citations to patents. In their study of information and communication companies, Hall and MacGarvie (2010) discovered that companies with software patents had somewhat higher market values than those without software patents.

We can notice that many studies show a positive influence of patent activity on business performance, such as sales, earnings, market value, and profitability. However, there are some studies in which their results, partly or completely, show a negative influence of patent activity on business performance or no impact on it.

In the study of Griliches et al. (1991), the impact of patenting policies on changes in market value was examined. They discovered that patent factors have essentially no impact on market value. Neuhäusler et al. (2011) examined the influence of different patent indicators on a company’s market value in a sample of 479 firms, in a period from 1990 to 2007. The outcomes demonstrate an insignificant correlation between the number of patent applications and firm market value, suggesting that the patent portfolio's plain size is only a partial indicator of the technology base. The influence of the share of granted patents on firm market value could not be confirmed nor disproved because none of the models in their analysis had statistically significant results.

Artz et al. (2010) examined the link between the company's commitment to investments in R&D and the resulting innovative results (the number of patents granted and the number of new product announcements). Then, they examined the relationship between patents and product announcements. Finally, they examined the impact of innovative results on return on assets (ROA) and sales growth. They tested their hypotheses on a sample of 272 companies from 35 industries. The results of their research indicate that investments in R&D have a positive influence on the number of granted patents and that the number of granted patents has a positive effect on product announcements, and product announcements have a positive impact on ROA and sales growth. However, a negative impact of granted patents on ROA and sales growth was established. These outcomes might be a result of the rise of strategic patenting, in which more businesses are employing patents as tactical tools.

Andries & Faems (2013) examined the effects of patenting on licensing, innovation, and financial success in a sample of 358 manufacturing companies. Their study shows that patenting helps SMEs commercialize product ideas. Furthermore, improved innovation performance leads to larger profit margins. The ability of companies to license knowledge to outside parties is also increased by patenting operations, and this beneficial effect is noticeably stronger for large companies. However, neither SMEs nor major corporations benefit financially in the short term from these external licensing operations. The study also shows that neither SMEs nor large businesses have significant cost disadvantages as a result of their patenting operations.

Lee et al. (2015) research the varied impacts of patents on sales, earnings, and market value in 28 international IT businesses, including patents generated from a) internal R&D, b) collaboration between university and industry, and c) transactions. They discovered that internal R&D-generated patents improve sales, profits, and market value. Purchased patents do not improve sales, but they do have minor, short-term beneficial effects on market value and profit. Patents developed by university-industry partnerships increase sales after more than two years, but they decrease market value. Internal R&D is continuously crucial for long-term business expansion, suggesting that the best way to foster inbound open innovation is by acquiring concepts, technology, and talent for internal R&D. Short-term growth is boosted by purchased patents, whereas medium and long-term growth depends on university-industry partnerships.

Garavito Hernandez & Rueda Galvis (2021) investigated the innovation and contribution of the registration of patents to the sales growth on a sample of 1,746 companies in Colombia in the manufacturing sector. Their findings confirm that patent registration has a detrimental impact on business efficiency. However, the research results show a positive correlation between incremental product improvements and the achievement of sales success.

2. Methodology of Research

The goal of this study is to explore the impact of R&D and patent activity indicators on the business performance of companies in the high-tech sector. The research is based on the data of the following indicators: R&D activity indicator - R&D investment (RD); Patent activity indicators - Number of granted patents (NGP), Published PCT applications (PPCTA); Business performance - Sales revenue (SR), Gross profit (GP), Operating profit (OP), Earnings before interest and taxes (EBIT), Earnings before interest, taxes, depreciation and amortization (EBITDA), Market capitalisation (MC), Return on equity (ROE).

Therefore, Figure 1 shows the research model.

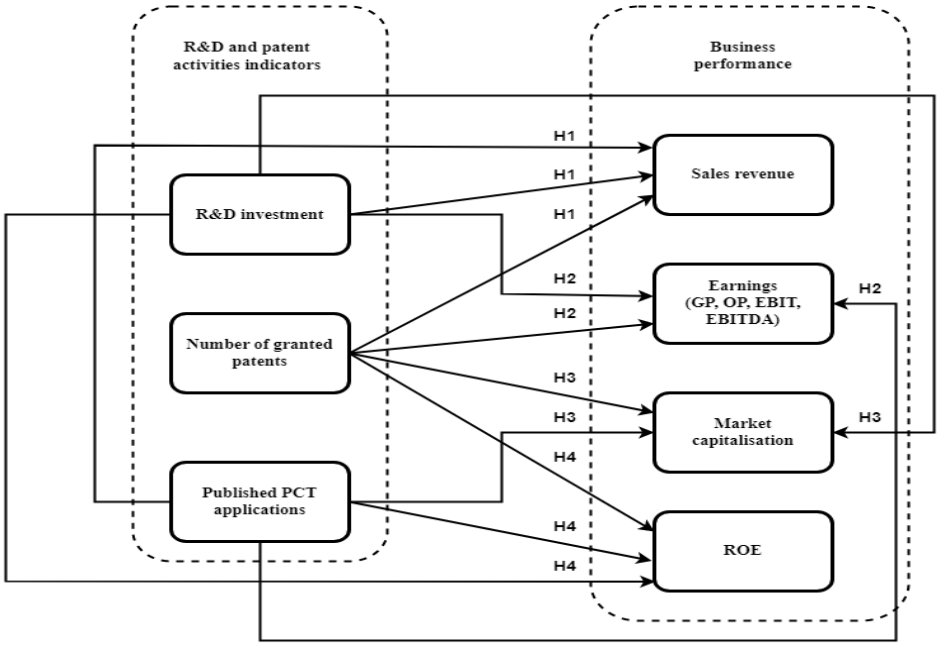

Fig. 1 Research conceptual framework
Source: Authors' presentation

The variables used in the research are explained and their computation process is presented.

The R&D investment (RD) is equivalent to expenditures in R&D.

The number of granted patents (NGP) represents the number of patents granted by USPTO (*USPTO* is the abbreviation of *United States Patent and Trademark Office*), as one of the 5 biggest national intellectual property offices in the world. Published PCT applications (PPCTA) show the number of published patent applications on the international level according to PCT. The PCT helps patent applicants in the process of patent protection, aids patent offices with their positive decisions for granting patents, and is a source of technical information relating to those inventions which is available to public. The PCT allows applicants to get protection for an invention in 157 contracting states simultaneously by filing a single international patent application.

SR, GP and OP are already calculated and presented in the companies' income statements. The following formula shows how the EBIT is computed (Krstić, 2022):

$$EBIT = Net\ profit + Income\ tax + Other\ taxes \pm Net\ financial\ profit\ (loss) \quad (1)$$

EBITDA allows comparisons of businesses operating in various nations and industries, with various internal finance policies, as well as accounting procedures for depreciation of tangible and amortization of intangible assets, EBITDA is an analytically better indicator. The following formula shows how the EBITDA is computed (Krstić, 2022):

$$EBITDA = EBIT + Depreciation + Amortization \quad (2)$$

MC is computed using the following formula:

$$MC = Number\ of\ shares * Share\ price \quad (3)$$

ROE is a traditional measure of company's profitability and it is calculated in the following way:

$$ROE = GP : E \quad (4)$$

In the previous formula, GP stands for Gross profit and E stands for equity which is calculated in the following way (Krstić, 2022):

$$E = Total\ assets - Total\ liabilities - Non\text{-}controlling\ interests \quad (5)$$

The following hypotheses were defined bearing in mind the various research presented in the literature review:

Hypothesis H1:
The R&D investment, Number of granted patents and Published PCT applications have a positive impact on the Sales revenue in the following year.

Hypothesis H2:
The R&D investment, Number of granted patents and Published PCT applications have a positive impact on the Gross profit, Operating profit, EBIT and EBITDA in the following year.

Hypothesis H3:
The R&D investment, Number of granted patents and Published PCT applications have a positive impact on the Market capitalization in the following year.

Hypothesis H4:
The R&D investment, Number of granted patents and Published PCT applications have a positive impact on the ROE in the following year.

The financial statements of the 33 high-technology companies that are on the WIPO's Top 50 PCT applicants list in the period from 2013 to 2020 were the database for this research. The other 17 companies were not included in the sample because they were not continuously on the WIPO's Top 50 PCT applicants list during the research period. The selected companies for this research, according to the mentioned criterion are: Samsung, Siemens, Huawei, LG Electronics, Ericsson, Sony Corporation, Microsoft, 3M, Apple, Intel, Bosch, Applied Materials, Qualcomm, Fujifilm, Murata Manufacturing, BASF SF, Hewlett-Packard Development Company, Panasonic Corporation, Mitsubishi Electric, NEC Corporation, Sharp Corporation, Hitachi, ZTE, Philips, Kyocera, Nokia, Google, LG Chemicals, Densco, Tencent, Halliburton Energy, BOE Technology, and Shenzhen China Star Optoelectronics Technology. By studying annual reports of the named companies, WIPO's PCT yearly review, USPTO's website and other publicly available databases, secondary data was obtained to calculate research variables and conduct analysis. 264 observations are covered by the analysis.

In the first two models, RD is an independent variable, while NGP and PPCTA are dependent variables. In the next two models, RDI is an independent variable, while NGP and PPCTA are dependent variables. In the next two models, RORDI is an independent variable, while NGP and PPCTA are dependent variables. In the seventh-thirteenth model, the influence of NGP on SR, GP, OP, EBIT, EBITDA, MC and ROE is assessed. The last seven models explore the influence of PPCTA on SR, GP, OP, EBIT, EBITDA, MC and ROE.

The Stata program (version 12.0) was used to test the suggested framework.

First, natural logarithm values were used to transmit all raw data.

Second, in 20 study models, panel regression analysis was performed to assess the impact of the independent variable on the dependent variable.

Finally, the fixed-effect model (FEM) and random effect model (REM) were tested following the identification of a balanced dataset and confirmation that the assumptions are true. The Hausman test was then run on each model to determine whether to use FEM or REM. The significance level for the Hausman test was set at 0.05. All results statistically significant less than 0.05 suggest the use of FEM, in other cases, when statistical significance is above 0.05, REM should be used (Gujarati, 2004).

3. RESULTS OF EMPIRICAL RESEARCH

The following part of the work presents the research models, which are examined using panel regression analysis of the data. First, Table 1 presents the effects of Research and development investment (RD) influence on business performance.

Table 1 Panel regression results – R&D investment as a predictor

Independent variable	Research models						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	ln SR FEM	ln GP FEM	ln OP FEM	ln EBIT FEM	ln EBITDA FEM	ln MC FEM	ln ROE FEM
Constant	7.848 (0.000)	7.206 (0.000)	6.851 (0.000)	6.985 (0.000)	5.371 (0.000)	9.236 (0.000)	4.277 (0.000)
ln L1RD	.444 (0.000)	.384 (0.000)	.282 (0.047)	.266 (0.063)	.498 (0.000)	.333 (0.000)	-.125 (0.000)
F / χ^2	**210.87 (0.000)**	**103.87 (0.000)**	**3.99 (0.047)**	**3.51 (0.063)**	**52.89 (0.000)**	**22.97 (0.000)**	**13.39 (0.015)**
R^2	.997	.995	.942	0.941	0.985	0.987	0.895

Note: p-value in the parentheses, ln – natural logarithm, L1 – one year lagged value.
Source: Authors' calculations

The explanation of the panel regression results where R&D investment is a predictor are given in Table 2.

Table 2 The explanation of the panel regression results – R&D investment as a predictor

Models	Explanation of the results
Model 1 measures the influence that RD has on SR in the following year. The positive influence is hypothesized.	The model explains 94.7% variation in data, and it is statistically significant (F = 210.87, p = 0.000). If RD increases by 1%, SR will increase by 0.444% in the following year and its effect is statistically significant at the 0.01 significance level.
Model 2 measures the influence that RD has on GP in the following year. The positive influence is hypothesized.	The model explains 99.5% variation in data and is statistically significant (F = 103.87, p = 0.000). If RD increases by 1%, GP will increase by 0.384% in the following year and its effect is statistically significant at the 0.01 significance level.
Model 3 measures the influence that RD has on OP in the following year. The positive influence is hypothesized.	The model explains 94.2% variation in data and is statistically significant (F = 3.99, p = 0.047). If RD increases by 1%, OP will increase by 0.282% in the following year and its effect is statistically significant at the 0.05 significance level.
Model 4 measures the influence that RD has on EBIT in the following year. The positive influence is hypothesized.	The model explains 94.1% variation in data and is statistically significant (F = 3.51, p = 0.063). If RD increases by 1%, EBIT will increase by 0.266% in the following year and its effect is statistically significant at the 0.1 significance level.
Model 5 measures the influence that RD has on EBITDA in the following year. The positive influence is hypothesized.	The model explains 98.5% variation in data and is statistically significant (F = 52.89, p = 0.000). If RD increases by 1%, EBITDA will increase by 0.498% in the following year and its effect is statistically significant at the 0.01 significance level.
Model 6 measures the influence that RD has on MC in the following year. The positive influence is hypothesized.	The model explains 98.7% variation in data and is statistically significant (F = 22.97, p = 0.000). If RD increases by 1%, MC will increase by 0.333% in the following year and its effect is statistically significant at the 0.01 significance level.
Model 7 measures the influence that RD has on ROE in the following year. The positive influence is hypothesized.	The model explains 89.5% variation in data and is statistically significant (F = 13.39, p = 0.015). If RD increases by 1%, ROE will decrease by 0.125% in the following year and its effect is statistically significant at the 0.05 significance level.

Source: Authors' calculations

Based on the explanation of the results in Table 2, we can conclude that models 1-7 are statistically significant. The positive impact of R&D investment on the indicators SR, GP, OP, EBIT, EBITDA, and MC – was confirmed. However, when it comes to the impact of R&D investment on return on equity, a negative impact was found. The high value of the variance of the dependent variable in all models, which is explained by the influence of R&D investment, means that R&D investment is a significant factor of the value of business performance of high-tech companies.

Table 3 illustrates how the Number of granted patents (NGP) influences previously mentioned business performances.

The explanations of the panel regression results where the Number of granted patents is a predictor are given in Table 4.

Table 3 Panel regression results – NGP as a predictor

Independent variable	Research models						
	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
	ln SR REM	ln GP REM	ln OP FEM	ln EBIT FEM	ln EBITDA REM	ln MC REM	ln ROE REM
Constant	9.599 (0.000)	8.662 (0.000)	7.855 (0.000)	7.838 (0.000)	7.588 (0.000)	10.940 (0.000)	3.073 (0.000)
ln L1NGP	.327 (0.000)	.290 (0.000)	.226 (0.088)	.228 (0.088)	.326 (0.000)	.182 (0.007)	.150 (0.015)
F / χ^2	**104.04 (0.000)**	**58.15 (0.000)**	**2.93 (0.088)**	**2.94 (0.088)**	**22.79 (0.000)**	**7.31 (0.007)**	**5.97 (0.015)**
R^2	.346	.226	.944	0.942	0.094	0.028	0.018

Note: p-value in the parentheses, ln – natural logarithm, L1 – one year lagged value
Source: Authors' calculations

Table 4 The explanation of the panel regression results – NGP as a predictor

Models	Explanation of the results
Model 8 measures the influence that NGP has on SR in the following year. The positive influence is hypothesized.	The model is statistically significant ($\chi^2 = 104.04$, $p = 0.000$). If NGP increases by 1%, SR will increase by 0.327% in the following year and its effect is statistically significant.
Model 9 measures the influence that NGP has on GP in the following year. The positive influence is hypothesized.	The model is statistically significant ($\chi^2 = 58.15$, $p = 0.000$). If NGP increases by 1%, GP will increase by 0.29% in the following year and its effect is statistically significant.
Model 10 measures the influence that NGP has on OP in the following year. The positive influence is hypothesized.	The model explains 94.4% variation in data and is statistically significant ($F = 2.93$, $p = 0.088$). If NGP increases by 1%, OP will increase by 0.226% in the following year and its effect is statistically significant at the 0.1 significance level.
Model 11 measures the influence that NGP has on EBIT in the following year. The positive influence is hypothesized.	The model explains 94.2% variation in data and is statistically significant ($F = 2.94$, $p = 0.088$). If NGP increases by 1%, EBIT will increase by 0.228% in the following year and its effect statistically significant at the 0.1 significance level.
Model 12 measures the influence that NGP has on EBITDA in the following year. The positive influence is hypothesized.	Model fit is significant at the level of $p < 0.01$ ($\chi^2 = 22.79$, $p = 0.000$). If NGP increases by 1%, EBITDA will increase by 0.326% in the following year and its effect is statistically significant.
Model 13 measures the influence that NGP has on MC in the following year. The positive influence is hypothesized.	The model is statistically significant ($\chi^2 = 7.31$, $p = 0.007$). If NGP increases by 1%, MC will increase by 0.182% in the following year and its effect is statistically significant.
Model 14 measures the influence that NGP has on ROE in the following year. The positive influence is hypothesized.	The model is statistically significant ($\chi^2 = 5.97$, $p = 0.015$). If NGP increases by 1%, ROE will increase by 0.15% in the following year and its effect is statistically significant.

Source: Authors' calculations

Data in Table 4 indicate that the models 9-14 are statistically significant. The positive impact of the Number of granted patents on all indicators of business performance in the following year - SR, GP, OP, EBIT, EBITDA, MC, and Return on equity – was confirmed.

Table 5 presents the results of Published PCT applications (PPCTA) influence.

Table 6 gives the explanations of the panel regression results where Published PCT applications is a predictor.

Table 5 Panel regression results – PPCTA as a predictor

Independent variable	Research models						
	Model 15	Model 16	Model 17	Model 18	Model 19	Model 20	Model 21
	ln SR REM	ln GP REM	ln OP REM	ln EBIT REM	ln EBITDA REM	ln MC REM	ln ROE REM
Constant	10.811 (0.000)	9.666 (0.000)	6.244 (0.000)	6.289 (0.000)	8.174 (0.000)	10.822 (0.000)	3.155 (0.000)
ln L1PPCTA	.146 (0.005)	.140 (0.012)	.439 (0.009)	.432 (0.011)	.236 (0.012)	.197 (0.023)	.123 (0.087)
F / χ^2	**7.79 (0.005)**	**6.27 (0.012)**	**6.77 (0.009)**	**6.47 (0.011)**	**6.38 (0.012)**	**5.18 (0.023)**	**2.93 (0.087)**
R^2	.035	.012	.028	.027	.028	.023	.002

Note: p-value in the parentheses, ln – natural logarithm, L1 – one year lagged value
Source: Authors' calculations

Table 6 The explanation of the panel regression results – PPCTA as a predictor

Models	Explanation of the results
Model 15 measures the influence that PPCTA has on SR in the following year. The positive influence is hypothesized.	The model is statistically significant ($\chi^2 = 7.79$, $p = 0.005$). If PPCTA increases by 1%, SR will increase by 0.146% in the following year and its effect is statistically significant.
Model 16 measures the influence that PPCTA has on GP in the following year. The positive influence is hypothesized.	The model is statistically significant ($\chi^2 = 6.27$, $p = 0.012$). If PPCTA increases by 1%, GP will increase by 0.14% in the following year and its effect is statistically significant.
Model 17 measures the influence that PPCTA has on OP in the following year. The positive influence is hypothesized.	The model is statistically significant ($\chi^2 = 6.77$, $p = 0.009$). If PPCTA increases by 1%, OP will increase by 0.439% in the following year and its effect is statistically significant.
Model 18 measures the influence that PPCTA has on EBIT in the following year. The positive influence is hypothesized.	The model is statistically significant ($\chi^2 = 6.47$, $p = 0.011$). If PPCTA increases by 1%, EBIT will increase by 0.432% in the following year and its effect is statistically significant.
Model 19 measures the influence that PPCTA has on EBITDA in the following year. The positive influence is hypothesized.	The model is statistically significant ($\chi^2 = 6.38$, $p = 0.012$). If PPCTA increases by 1%, EBITDA will increase by 0.236% in the following year and its effect is statistically significant.
Model 20 measures the influence that PPCTA has on MC in the following year. The positive influence is hypothesized.	The model is statistically significant ($\chi^2 = 5.18$, $p = 0.023$). If PPCTA increases by 1%, MC will increase by 0.197% in the following year and its effect is statistically significant.
Model 21 measures the influence that PPCTA has on ROE in the following year. The positive influence is hypothesized.	The model is statistically significant ($\chi^2 = 2.93$, $p = 0.087$). If PPCTA increases by 1%, ROE will increase by 0.123% in the following year and its effect statistically significant at the 0.1 significance level.

Source: Authors' calculations

It can be noted, according to the explanation of the results in Table 6, that the models 15-21 are statistically significant. The positive impact of the published PCT applications on all indicators of business performance in the following year - SR, GP, OP, EBIT, EBITDA, MC, Return on equity – was confirmed.

Having in mind all the presented results it is noticeable that the research hypotheses H1, H2 and H3 have been confirmed. However, the research hypothesis H1 has been partly confirmed.

4. DISCUSSION

The research results indicate that the first hypothesis has been confirmed, i.e. the positive impact of R&D investment, number of granted patents and published PCT applications on the sales revenue in the following year has been determined. The positive impact of investment in R&D on sales revenue was also determined in the research of Yun & Kim (2021). Furthermore, the positive impact of the number of patents on sales revenue was identified within the study of Scherer (1965), while the research of Comanor & Scherer (1969) and Ernst (1995) discovered the positive impact of the number of patent applications and the number of patents on sales revenue. Similar conclusions are present in the research of Ernst (1995), Ernst (2001), Nerkar and Roberts (2004), Lee & Yoon (2006) and Yang et al., 2021. Lee et al. (2015) point out that internal R&D-generated patents and patents developed by partnerships between university and industry increase sales; however, purchased patents do not improve sales. On the other hand, Artz et al. (2010) and Garavito Hernandez & Rueda Galvis (2021) found a negative impact of the number of recognized patents on sales revenue. Such a situation is possible due to the preservation and use of the patent for strategic purposes. Given the established positive impact of R&D activities and patent activity on the sales revenue of high-tech companies, they should view their investments in R&D and their patent portfolio as a strategic means of increasing market share.

The second hypothesis that the R&D investment, number of granted patents and published PCT applications have a positive impact on the GP, OP, EBIT, EBITDA in the following year has been confirmed. Yun & Kim (2021) have come to the same conclusion regarding the effect of R&D investment on operating profit. Xu et al. (2022) reached a similar conclusion when the influence of patent activity, as a moderator of the influence of R&D activities, on operating profit is in question. Lee et al. (2015) found that internal R&D-generated and purchased patents have beneficial effects on profit. On the other hand, Andries & Faems (2013) indicate that companies do not realize positive financial effects in the short term from their patent activity. Considering the established positive impact of indicators of research and development activities and patent activity on profit, high-tech companies should see these activities as a generator of corporate growth.

The third hypothesis was also confirmed, that is, the research and development investment, number of granted patents and published PCT applications have a positive impact on the MC in the following year. The results of the Griliches (1981) research are in agreement with the stated conclusion. Within the study, a positive influence of R&D expenditures and the number of patents on the market value was determined. The positive impact of successful patent applications on the market value of companies was proven in the research of Pakes (1985). A significant positive correlation of R&D activities and patent activities, on the one hand, and the market value of companies, on the other, was also

determined in the research of Bosworth and Rogers (2001), Hall et al. (2005) and Hall and MacGarvie (2010). However, Griliches et al. (1991) and Neuhäusler et al. (2011) found in their studies that there is no impact of patent activity on market value. Lee et al. (2015) discovered that patents which are results of internal R&D activity and purchased patents increase market value, while patents developed by university-industry partnerships decrease it. The positive impact of R&D activities and patent activity on the market value of high-tech companies, which was established in this research, indicates the importance of innovativeness of companies and that the market recognizes, values and rewards it.

The fourth hypothesis that the research and development investment, number of granted patents and published PCT applications have a positive impact on the return on equity in the following year has been partially confirmed. The positive impact has been proven regarding the influence of the number of granted patents and published PCT applications on the return on equity in the following year. However, the influence of the R&D investment on the return on equity in the following year is negative. In the research of Czarnitzki and Kraft (2010) and Andries & Faems (2013), the positive impact of patent activity on profitability was confirmed. On the other hand, Artz et al. (2010) found a negative impact of the number of recognized patents on profitability. For high-tech companies that have significant investments in R&D, it is important to keep in mind the longer period of time needed to achieve a return on investment that ensures a satisfactory level of profitability.

Bearing in mind the research results of this study, as well as the research results of the studies presented within the literature review, it can be noted that the originality of this study is reflected in studying the influence of patent activity indicators on GP, EBIT, EBITDA and return on equity.

6. CONCLUSION

The research investigates the effect of R&D activities and patent activities on the business performance of high-tech companies. The indicator of research and development activities that was used in the empirical part of the work is Research and development investment. Indicators of patent activity, that were also used in the empirical part of the work, are the number of granted patents and published PCT applications. Business performance indicators on which the impact of patent activity indicators was examined are: sales revenue, gross profit, operating profit, earnings before interest and taxes, earnings before interest, taxes, depreciation and amortization, market capitalization and return on equity.

The first hypothesis that the research and development investment, number of granted patents and published PCT applications have a positive impact on the sales revenue in the following year, has been confirmed. This is in accordance with the conclusions of research such as Comanor and Scherer (1969), Lee and Yoon (2006), Yang et al. (2021), Yun & Kim (2021), etc.

The second hypothesis that the research and development investment, number of granted patents and published PCT applications have a positive impact on the gross profit, operating profit, earnings before interest and taxes, earnings before interest, taxes, depreciation and amortization in the following year has been confirmed. Yun & Kim (2021) have come to the same conclusion regarding the impact of research and development investment on operating profit. Xu et al. (2022) reached a similar conclusion when the

influence of patent activity, as a moderator of the influence of R&D activities, on operating profit is in question.

The third hypothesis that the research and development investment, number of granted patents and published PCT applications have a positive impact on the market capitalization in the following year has been confirmed. Research such as Hall et al., (2005), Hall and MacGarvie (2010), Lanjouw and Schankerman (2004) etc. reach the same conclusion.

The fourth hypothesis that the research and development investment, number of granted patents and published PCT applications have a positive impact on the return on equity in the following year has been partly confirmed. The positive impact has been proven regarding the influence of the number of granted patents and published PCT applications on the return on equity in the following year. However, the influence of the research and development investment on the return on equity in the following year is negative. In the research of Czarnitzki and Kraft (2010) and Andries & Faems (2013), the positive impact of patent activity on profitability was also confirmed.

The originality of this study is reflected in studying the influence of patent activity indicators on gross profit, earnings before interest and taxes, earnings before interest, taxes, depreciation and amortization and return on equity.

However, there are some limitations that we encountered through our research. The companies in the analysed sample were chosen by using the criterion that they were on the WIPO's Top 50 patent applicants list in the period from 2013 to 2020. 33 out of 50 companies were on the list throughout the examined period and the data for the other 17 companies was unavailable since they were not on that list every year through the examined period. Also, the patent activity indicator - Number of granted patents included only patents that were granted by the USPTO, which is one of the 5 biggest national patent offices and it has and shares the statistics on the number of granted patents by organisations. That is not the case with other intellectual property offices. Usually, the data presented by other national intellectual property offices, which refers to patent statistics, includes the number of granted patents by countries, or only the statistics about patent applications (such as the European Patent Office).

The research results contribute to the management of high-tech companies in making future decisions in the field of R&D and intellectual property, as well as to the management of business performance. Namely, the positive impact of R&D investment on all observed business performance, except for return on equity, indicates that it is necessary to make decisions about investments rationally and thoroughly, bearing in mind the longer period of time required to realize the return on investments in R&D that implies a positive impact on the profitability of the company. Managers of intellectual property should strive to maximize the positive impact that patents have on business performance when making decisions related to the use of the patent portfolio. Finally, managers managing business performance should have built-in coordination and communication with the previously mentioned management in order to align the decisions and timing of their realization in the field of R&D and intellectual property with the financial aspect of a business.

This research indicates and confirms the importance that R&D activity, as well as patenting activity, have on the business performance of high-tech companies. In this research, the direct influence of independent on dependent variables, namely the indicators of R&D activities and patent activities on the indicators of business performance has been examined. It is recommended for future research that control variables, which will be related to the size of

the company or the sector in which it operates, should be included in the analysis. It is also desirable to continue and expand the research, by examining the impact of research and development and patenting activity on business performance in the next 2 to 5 years. This research examines their impact on business performance in the following year. Regarding that R&D and patenting activities require a certain time in order to maximize their benefits for the company, it is necessary to take a longer period into account when examining the impact of these activities on business performance. That is in order to obtain a precise conclusion about the effectiveness and efficiency of investing in these activities, which are the core of recognition and differentiation of high-tech companies on the market and the factor of their competitiveness and business success.

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UTICAJ AKTIVNOSTI ISTRAŽIVANJA I RAZVOJA I PATENTNE AKTIVNOSTI NA POSLOVNE PERFORMANSE: SLUČAJ VISOKO-TEHNOLOŠKIH KOMPANIJA

Cilj rada je da se utvrdi uticaj aktivnosti istraživanja i razvoja i patentne aktivnoti na poslovne performanse visokotehnoloških kompanija sa najvećim brojem patentnih prijava prema evidenciji Svetske organizacije za intelektualnu svojinu.

Itsraživački uzorak čine 33 visokotehnološke kompanije koje se kontinuirano nalaze na ovoj listi Top 50 PCT aplikanata Svetske organizacije za intelektualnu svojinu u periodu od 2013. do 2020. godine. Regresiona analiza je primenjena kako bi se utvrdio uticaj aktivnosti istraživanja i razvoja i aktivnosti patenta na poslovne performanse visokotehnoloških kompanija.

Istraživanje potvrđuje značaj istraživačko-razvojne i patentne aktivnosti za poslovanje visokotehnoloških kompanija. Ova studija je otkrila da ulaganja u istraživanje i razvoj, broj odobrenih patenata i broj objavljenih PCT prijava imaju pozitivan uticaj na prihod od prodaje, bruto dobit, poslovnu dobit, zaradu pre kamata i poreza, zaradu pre kamata, poreza, deprecijacije i amortizacije, tržišnu kapitalizaciju. Pozitivan uticaj indikatora patentne aktivnosti na prinos na kapital je takođe prisutan, međutim, uticaj ulaganja u istraživanje i razvoj na prinos na kapital je negativan.

Evaluacija predstavljenih rezultata može poslužiti kao osnova za dalje zaključke, doprineti postojećoj literaturi i strategiji istraživačko-razvojne i patentne aktivnosti visokotehnoloških kompanija.

Originalnost ove studije ogleda se u proučavanju uticaja indikatora patentne aktivnost - broj odobrenih patenata i broj objavljenih PCT prijava - na bruto dobit, zaradu pre kamata i poreza, zaradu pre kamata, poreza, amortizaciju i prinos na sopstveni kapital.

Ključne reči: *istraživanje i razvoj, patentna aktivnost, poslovne performanse, visokotehnološke kompanije*

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