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 Tomas Bata University in Zlín  
Faculty of Management and Economics

**Conference Proceedings**  
**DOKBAT 2022**  
**18th International Bata Conference**  
**for Ph.D. Students and Young Researchers**



**Tomas Bata University in Zlín**  
**Faculty of Management and Economics**  
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# **JOB SATISFACTION IN REMOTE WORK CONTEXT: THE MEDIATING EFFECT OF WORK-LIFE BALANCE AND DIGITAL HRM SUPPORT**

*Nguyen Tu Lan Anh, Nhat Tan Pham, Ha Thanh Nga, Nguyen Thi Thu Huong*

## **Abstract**

By analysing of quantitative data from remote workers of technology and construction firms, this study attempts to contribute to the literature of HRM by implementing digital technology into HRM practices to drive employee job satisfaction and work-life balance, particularly in the remote work environment. A survey questionnaire was handed out target respondent who working remotely mainly in IT and construction sector in Ho Chi Minh, Viet Nam. Out of 215 samples responded to the study, 208 usable samples were utilized to measure the proposed hypotheses. After measuring the reliability and the validity of scales by Cronbach's Alpha and Exploratory Factor Analysis, regression model analysis was conducted to evaluate the impact of digital HRM in the relationship between work-life balance and job satisfaction by SPSS 25. The findings of study show that digital HRM plays an important function of organization in terms of boosting satisfaction of remote workers as well as enhancing the relation to employee with their working and non-working time. Additionally, the mediating effect of work-life balance in association with digital HRM and job satisfaction has been confirmed from this study.

*Keywords: digital HRM, work-life balance, job satisfaction, remote work*

## **1 INTRODUCTION**

In most countries nowadays, the movement of their societies is becoming more active and mobile in their daily activities and also their tasks at work. Thanks to the advances of technology and changes of culture, the teleworking trend is increasing so as to help employees can spend time with their families and continue working at the same time (Hunter, 2018). Moreover, teleworkers have a very different lifestyle from those who present at work all the time, they have to focus on the outputs and more concern about the resources, expected standards, and timescales, which makes them become more self-reliant (Cattell, 2004).

Numerous studies have found a connection between telework and increased productivity (Allen *et al.*, 2015; De & Kelliher, 2011, 2016; O'Neill *et al.*, 2014), teleworkers may be able to concentrate on their job duties more efficiently than office workers because they do not have the pressures of the office and are less involved in corporate politics (Fonner and Roloff, 2010). There is substantial empirical evidence that employees working in flexible arrangements increases not only self-reported productivity but also supervisor-rated efficiency (Sullivan, 1996). Managers must rely on output-related metrics and alternative control strategies, frequently using technology as well as confidence, while supervising remote employees to both assess and manage performance quality and quantity (Felstead *et al.*, 2003).

Remote work is a kind of way that employee's tasks could be done without at office even though its form does not really common in Vietnam. In fact, remote work is suitable with employees that are always busy with personal tasks or family tasks instead of taking leaving. Especially, during pandemic outbreak leads all business around the world re-arranged structure of work as no really need to come the office. Although teleworkers do not need to come to work at the company, they also have to complete the tasks on time as well as the workers at the workplace.

However, in order to work at home, employees must be good at digital skills to solve unexpected problems during working time efficiently. But not everyone possesses good digital skills, the HR department and management teams have to have some specific programs or policies to help employees develop their skills. Besides, levels of employees' digital skills are also fluctuated, and their levels are not equal. Additionally, when there are some people who are bad at using digital devices, it takes some time for them to enhance their skills, which will increase their time of completing their tasks and disorder the time they take after of their family. Especially their job satisfaction may be affected as well.

Despite having many studies and research about remote working, employees' work-life balance, and teleworkers' job satisfaction separately (Wang et al., 2020; White et al., 2003; Locke, 1969). But they still neglect to clarify the relationships between them, in particular the mediating role of work-life balance in terms of enhancing employee job satisfaction in the remote work of Viet Nam condition. Once these relationships clarified, the organizations will be suggested some ways to enhance the digital skills levels of employees working from home, improve their work-life balance, and accelerate their job satisfaction.

Therefore, this research aims to clarify the relationship between digital HRM practices, teleworkers' work-life-balance and their job satisfaction in the remote work in Viet Nam. This study attempted to provide empirical evidence for firms to understand the importance of developing teleworkers' digital skills and the role of balance working time and non-working time as a mediation so as for employee to get fulfillment with job in work remotely.

After the introduction section, the paper presents the theoretical background and hypotheses development. The authors then illustrate the research methods. Subsequently, this study shows the empirical results to test hypotheses and discusses the research findings. Finally, the authors conclude this study, provide theoretical and practical implications, and clarify limitations and further studies.

## **2 THEORETICAL BACKGROUND**

*The impact of digital HRM practices to work-life balance and job satisfaction of remote workers.*

The wave of innovation in fourth industrial revolution has been changing our life (Braña, 2019). Technological development reshaped the structure of working where employers find it easier to assign tasks without boundary and reducing of cost (Colbert & George, 2016). Especially, working remotely makes employee more flexible, it's also necessary for them to control the time for the space of work and non-work (Coenen and Kok, 2014, and Kossek et al., 2015). Clearly, the world today is entering the digital age causing many changes in cultures, societies, and economy due to its advances. Technology as a part of HRM which leads to the existences of digital changes (Strohmeier, 2014). Digital employee management is a phenomenon called electronic HRM (e-HRM), which refers to the implementation, planning, and application of digital technologies so as to help and connect the HR profession (Bondarouk and Ruel, 2009). It has been seen that HRM play a vital role in employee work-life effectiveness (Milliken, Martins and Morgan, 1998). HRM practices also help a balance of work and life's workers and the significant role of employers strongly supported to employees in their effort, satisfaction and engagement with their job as well (Burnett & Lisk, 2019). Thus, it is beneficial not only for organization by taking advantage of digital HRM in order to control remote workers and exert power them, but also technologies be adopted to allow for good work-life balance among workers (Miele & Tirabeni, 2020). Accordingly, the hypothesis was proposed by the following:

H1: Digital HRM has positive impact on work-life balance of remote workers.

H2: Digital HRM has positive impact on remote workers' job satisfaction.

#### *Work-life balance and Job Satisfaction*

Work-life balance has never seen as a new term in its popular outcomes. This term is assumed to be the time and psychological energy's allocation in order to balance working time and personal time while gaining satisfaction from both of two side (Greenhaus et al., 2003). Furthermore, as Greenhaus and Allen pointed out in 2011, so as to help teleworkers accommodate their work-life balance needs, the organization willingly to offer the flexible working programs, for example, telework signals; therefore, as a gesture of work-life balance support of the organization, remote workers are likely to follow their organization's work arrangements. Some researchers found that employees who got a higher level of obligation balance with their work and life roles tend to be more fulfilled of their job (Ferguson, Carlson, Zivnuska & Whitten, 2012; Harini et al., 2019) and their mental health (Lunau et al., 2014; Haar et al., 2014; Ali et al., 2020). Besides, it has been argued that people have remote work will be able to get a maintaining of work-life without lost productivity (Sullivan, 2012; Felstead & Henseke, 2017) leading a fulfillment of job (Bellmann and Hübler, 2020). Work-life balance also can be seen as one of the main predictors for organization outcomes such as job performance (Bloom & Van Reenen, 2006; Smith, 2010; Soomro et al., 2018; Johari et al., 2018) organizational commitment (Felstead & Henseke, 2017) and job satisfaction (Haar et al., 2014; Harini et al., 2019). Thus, the hypothesis was proposed by the following:

H3: Work-life balance has positive impact on job satisfaction of remote workers.

### **3 METHODOLOGY**

#### *Sample and data collection*

This study employed a quantitative research approach to evaluate the impact of digital HRM in associated with work-life balance and job satisfaction under condition of working remotely. The survey was taken place by current workers working mainly from two sectors which adapted for flexible work arrangement, so as to clarify the relationships between their digital skills oriented by HRM and fulfilment at work. The survey by Google Forms was sent to the teleworkers' emails whom working mainly from IT and construction firms. The questionnaire was sent to the respondents, along with a brief introductory outline that described the study's aims and ensured the privacy and confidentiality of the information given.

After several months for data collection, 215 target respondents were returned with diverse background such as aged, job position and education. After data cleansing to remove some incorrect records, the number of samples remaining accurate to be 208, account for over 96%. Data, then, was used to analyze and evaluate the proposed hypotheses by SPSS 25 software.

#### *Measurement*

This study adopted independent variables and dependent variable based on literature and existing scales. This study used six items to measure work-life balance by Gröpel and Kuhl (2009), five items (Anderson, 2002) to measure job satisfaction and the scale of HRM practices with eight items by Chuang and Liao (2010) under digital context were utilized. A total of 19 items were developed from previous studies to measure the impact of digital HRM practices with work-life balance and employee job satisfaction in remote work situation.

These items with closed-ended questions adopted the existing scale validation were measured by five-point Likert Scale with strongly disagree (1) to strongly agree (5).

*Reliability and validity test*

In order to test reliability of scale, the internal consistency of observable variables within a latent variable. Firstly, Cronbach’s coefficient alpha was conducted by SPSS 25. The result from table 1 indicated Cronbach’s alpha of scale were higher than 0.8 and the corrected item-total correlation of variables greater than 0.3. Thus, all scales satisfied the requirement for reliability (Peterson and Kim, 2013). Second, the exploratory factor analysis (EFA) was used to measure the validity of scales, to eliminate variables did not fit discriminant validity and convergence validity. The results of EFA from table 1 also shows that scales satisfied of requirement with factor loadings (>0.6), KMO’s value is 0.896 which is close to 1.0 and higher than 0.5, p-value is less than 1%, total of variance extracted and the number of factors extracted are satisfied (Chalmers & Yates, 1989).

Tab. 1 - Result of reliability and validity. Source: own research

KMO and Bartlett's Test: .896				
% Cumulative Variance: 70.953				
Eigenvalue:1.468				
Cronbach’s alpha	Items	Component factors		
		(dHRM)	(WLB)	(S)
Digital HRM practices = .94	dHRM1	.819		
	dHRM2	.819		
	dHRM3	.825		
	dHRM4	.859		
	dHRM5	.830		
	dHRM6	.811		
	dHRM7	.802		
	dHRM8	.855		
Work – life balance = .91	WLB1		.768	
	WLB2		.845	
	WLB3		.744	
	WLB4		.791	
	WLB5		.838	
	WLB6		.708	
Job satisfaction = .86	JS1			.805
	JS2			.725
	JS3			.775
	JS4			.714
	JZ			.654

## 4 RESULTS

### *Sample descriptive analysis*

Descriptive statistic result of employee working remotely those who coming from different aspects of the offices from construction and technology firms, mostly including from 201-305 employees to 351-500 employees, accounted for 51.9% and 48.1% respectively. There were 208 eligible teleworkers to complete this survey with 40.4% female and 59.6% male, most of employees age from 18 to 25 occupying 41.3%, ages from 26 to 35 by 33.7%. Among those respondents, approximately 78% in undergraduate and 22% in postgraduate background. Moreover, nearly 65% of the sample are working in IT as engineers and administrative works, 34% working in Building and Construction.

### *Correlations*

According to table 2 for the result of Pearson correlation shows that the relationship between DHRM and WLB is  $r=0.398$ , which illustrates that there is a moderate positive linear relationship between the variables. The value's Sig (2-tailed) of DHRM and JS is 0.455 also a medium positive linear relationship but stronger than WLB. Moreover, the Pearson correlation of the relationship between WLB and JS is recorded as a strong positive relationship, with Sig (2-tailed) is 0.613. Furthermore, the p-Value of all variables are smaller than 0.001 showing the possibilities of the existence of a non-zero correlation coefficient. To sum up, the relationships' direction is positive, which means that these variables are associated with each other.

Tab. 2 - Result of Pearson correlation. Source: own research

		DHRM	WLB	JS
DHRM	Pearson Correlation	1	.398**	.455**
	Sig. (2-tailed)		0.000	0.000
	N	208	208	208
WLB	Pearson Correlation	.398**	1	.613**
	Sig. (2-tailed)	0.000		0.000
	N	208	208	208
JS	Pearson Correlation	.455**	.613**	1
	Sig. (2-tailed)	0.000	0.000	
	N	208	208	208
**. Correlation is significant at the 0.01 level (2-tailed).				

### *Regression analysis*

The result of regression analysis from table 3 shows that digital HRM practices and work-life balance has positive impacts on job satisfaction. In details, the beta value of digital HRM

practices (0.215) and work-life balance (0.446) are both statistically significant as their p-value of 0.000 is smaller than 0.05. Work-life balance in a higher level of beta value plays an important factor in order to boost satisfaction of workers. Furthermore, the result of analysis also indicates that digital HRM practices has a positive impact on work-life balance among teleworkers with the value of beta is 0.392 and their p-value is smaller than 0.05. This can be explained that digital HRM practices has a positive direct and indirect impact on employee's satisfaction of job in the remote work context and work-life balance play a mediating role in the relationship between digital HRM practices and job satisfaction in the remote context.

Tab. 3 - Result of regression analysis. Source: own research

Effects	Beta	Std. Error	T-value	P-value
Digital HRM practices -> Work-life balance	0.392	0.063	6.230	0.000
Digital HRM practices -> Job satisfaction	0.215	0.049	4.354	0.000
Work-life balance -> Job Satisfaction	0.446	0.050	8.907	0.000

The table 4 can conclude the hypothesis with data support:

Tab. 4 - Hypothesis conclusion. Source: own research

Hypothesis	Conclusion
Digital HRM practices has positive impact on work-life balance of remote workers.	Accept (***)
Digital HRM practices has positive impact on remote workers' job satisfaction.	Accept (***)
Work-life balance relates positively to job satisfaction of remote workers	Accept (***)

(\*\*\*) : Significant level at  $p=0.01$

### *Mediating effect of work-life balance*

According to Baron – Kenney (1986), a variable function as a mediator when it meets conditions such as the independent variable significantly affect to mediator variable as well as the dependent variable and the links of mediator variable with dependent variable must be significant. A full mediating effect occurs when the relation of independent variable and dependent variable are unable to experience without the relation of mediator between independent and dependent variable.

Regression analysis in table 3 depicts the positive significant of digital HRM with job satisfaction as well as work-life balance and the significant relationship between work-life balance and job satisfaction which means that work-life balance partially mediated the relation between digital HRM and job satisfaction in the remote work context.

## **5 DISCUSSION**

This study evaluated the relationship between work-life balance and job satisfaction among remote workers. This is appropriate with some previous studies which confirmed about work-life balance leading to improve employee performance (Haar et al., 2014; Soomro et al., 2018; Harini et al., 2019) and their satisfaction (Felstead & Henseke, 2017; Bellmann and Hübler, 2020; Ali et al., 2020). Furthermore, this study also indicates the existing of the relationship

between digital HRM practices, work-life balance and job satisfaction of employee those whose work are in distance. Specifically, the positive perceptions about digital HRM practices increase work-life balance and job satisfaction of teleworkers. For details, human resource manager, one of the vital roles of organization in terms of digital technologies support to control quality of employee outcomes under remote work condition by giving out digital HRM practices. This is somehow suitable with some findings (Burnett & Lisk, 2019) to measure employee engagement and their effectiveness in associate with digital workforce capacity of organization and the way that managers use digital technologies to reshape power within workplace (Miele & Tirabeni, 2020).

## 6 CONCLUSION

Digital HRM practices and work-life balance has been proved as most important factors which affected to productivity and employee satisfaction of job. Especially, most of business decided to let employee choose work modes or work from home due to pandemic outbreak, leading them are able to utilize technologies to track outcomes and productivity. The fact is that digital technologies have been playing an essential part of our life, if organization implement digital technologies by improving and developing on HRM practices, teleworkers' digital skills, work-life balance and their satisfaction will be able to reinforce. Therefore, the firms' management should restructure the digital HRM system so as for teleworkers' work-life balance and job satisfaction to be positive improvement. It also has an effectiveness on remote workers' motivation, turnover rate, and motivation.

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# DIGITALISATION OVERRIDES MICHAEL PORTER'S THEORIES

*Stephan Bauriedel*

## **Abstract**

Micheal E. Porter, business professor and U.S. economist, has taught for more than 30 years that companies can defend their competitive position through strategic management. But developing digital strategies is no longer about defending a piece of the pie, but gaining the whole pie.

According to Porter's theories, stationary music distribution, for example, would be divided into brand, discounters and special niche providers for punk, techno or classical music. This is an insane idea, as local retail has been completely disrupted. Apple's iTunes vividly demonstrates how one platform unites all the world's music on itself. Porter's theories have failed to defend the analog world and the digital world ignores him.

This argumentative publication demonstrates that Porter's theories were developed for an analog world with physical boundaries. Two drivers of digitization, digital goods and digital business models, break these physical boundaries and invalidate Porter's theories. The subject of this paper is to compare Porter's theories with the requirements for digital strategies. Using a prominent example from music distribution, the restrictions, operational efforts and strategic tools are elaborated.

The result shows that digital strategies focus on market penetration and the customer, while Porter's strategy is a defense of the own market position. The phenomenon of "the winner takes it all" overrides Porter's theories.

**Keywords:** *strategy development, digitisation, digital strategies, michael e. porter*

## **1 INTRODUCTION**

Micheal Porter is a US economist and one of the most renowned management theorists in the world. As a co-founder of the concept of strategic management, he researched strategy development and competition as part of his work. His book "Competitive Advantage" (Porter, 1988), which is considered a standard work in management literature, deserves special mention.

Every student of business administration, every professor at a business university, every manager in a company and every strategy consultant knows and follows the principles of strategic management. Porter's theories of competitive strategy - Generic Competitive Strategies, Value Chain and Five Forces - are required reading.

Initially, there is no connection between Porter's theories and digitalisation. But the old doctrines are made for an analogue world with physical boundaries and digitalisation breaks these boundaries. Digitalisation follows other success factors and ultimately overrides Porter's theories.

The problem is that companies that start to develop a digital strategy or initiate the digital transformation follow the wrong rules. Those who apply Porter's theories in the digital world ignore the potential of digitalisation. An analogue strategy for a digital world will fail.

On the other hand, all decision-makers who develop a digital strategy are polarised on the old analogue doctrines. For years, Porter's approaches were taught and sold as an unassailable truth.

Now the digital age is beginning and it is necessary to rethink. First, it is necessary to realise that digital strategies follow different rules, then it is a matter of understanding the digital success factors and finally the old analogue principles must be discarded.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

Porter's theories only require a brief consideration, as they belong to the general state of knowledge in the field of strategy development. For the development of digital strategies, it remains immeasurable to explain some new technical terms to substantiate the chain of reasoning.

### **2.1 Porters Theories**

With the Generic Competitive Strategies (Porter, 1988, p. 11) Porter asks companies to choose one approach: Cost Leadership, Differentiation or Focus, to achieve a return well above the market average. The return on investment of a company. is the result of the value generated and the costs of all individual activities. He writes: "... value is, what buyers are willing to pay for a product or service and the cost of performing the activities involved in creating it." (Porter, 1988, p. XVI)

The value chain he designed (Porter, 1988, p. 37) is divided into five core functions (inbound logistics, operations, outbound logistics, marketing & sales, services). In addition, there are four supporting functions (firm infrastructure, human resource management, technology development, procurement).

With the Five Forces he shows the power between customers, suppliers and competitors as well as the possibility of market entry by third parties and displacement by substitutes. "The five forces determine industry profitability because they influence the prices, costs, and required investments of firms in an industry - the elements of return of investment" (Porter, 1988, p. 5), according to the US economist.

### **2.2 Digitisation**

There are many descriptions of digitalisation in the literature. Klaus Schwab (Schwab, 2016), founder of the World Economic Forum in Davos, has dealt extensively with digitalisation and speaks of the fourth industrial revolution. He sees a profound change in human civilisation with a multifaceted interaction between technology and society.

Klaus Macharzina gives a technically oriented and a comprehensive definition of digitalisation. The technical definition is: "Digitisation is the preparation of information so that it can be processed and stored in a computer system or in computer networks." (Macharzina & Wolf, 2018, p. 1057) The second, comprehensive definition is: "Digitisation is the worldwide processing and penetration of information and communication technology in virtually all areas of human activity and thus also in companies." (Macharzina & Wolf, 2018, p. 1057)

"Digitalisation is the technology that connects people, companies and products worldwide and enables the storage, processing and exchange of information in electronic form" (Bauriedel, 2020d), according to the author's definition. He sees the internet as the technology that enables the systemic exchange of data worldwide and constitutes digitalisation. In his studies, he has defined four attributes (Bauriedel, 2020c) that make it possible to identify digitalisation as such.

For Patrik Stähler, digitalisation stems from the fusion of two basic technologies, information and communication technology. He defines digitalisation as follows: "Digital information and communication technology is the basic technology of the digital network economy. The new enabling technology has emerged from the convergence of information technology

(information processing) and communication technology (information transmission)" (Stähler, 2002, p. 30). In addition, he formulates the property of ubiquity (Stähler, 2002, p. 181), which is a compelling feature of digital business models.

### **2.3 Digital goods**

Digital goods are intangible products (images, audio, video, information) or virtual services (games, software, cloud computing). In contrast to physical goods, they have special characteristics: easy reproduction, simple processing, easy distribution, multiple ownership and no wear and tear or loss (Clement et al., 2019, p. 36). The exchange of digital goods via networks makes them independent of time and space (Stähler, 2002, pp. 112–113). The mass distribution of digital goods requires the standardisation of file formats (e.g. html, pdf or jpeg) (Covell, 2000).

### **2.4 Digital business models**

Christian Hoffmeister sees business models as a development process for standardised trade. "Through the permanent repetition of processes, a trial-and-error procedure becomes a fixed procedure that serves as a binding instruction for all employees." (Hoffmeister, 2013, p. 6) Business models are evolving from individual to dominant to unstable. Traditional business models - in his view - are becoming increasingly unstable because "the internet creates new needs through new service models. At the same time, known needs are being satisfied differently than before. This leads to changes also in established industries through new providers with new business models." (Hoffmeister, 2013, p. 20)

Patrick Stähler examined digital business models at an early stage. He explains, "By means of business models, information management attempts to map the reality of a company with its processes, tasks and communication relationships onto an IT system in order to support the company in its tasks." (Stähler, 2002, p. 38) He names three components of a business model: the value proposition, the architecture of value creation and the revenue model. (Stähler, 2002, p. 42) In addition, he points out, "Business models on the Internet are only new if they also use the possibilities of new media, i.e. ubiquity, the activity of the information carrier, networking and multimedia, although it is not crucial to use all features simultaneously." (Stähler, 2002, p. 181)

Alexander Osterwalder has taken Stähler's concept of a business model and developed it further. His definition is: "A business model describes the basic principle by which an organisation creates, conveys and captures value." (Osterwalder & Pigneur, 2011, p. 6) In contrast to a traditional business model, the digital business model focuses on the possibilities of digital technologies. Digital business models satisfy basic needs in a new way (Stähler, 2002) and they are better in the performance characteristics that are important for the customer (Christensen, 2016).

### **2.5 Long Tail / Free**

Chris Anderson describes the long tail as an infinite sales shelf in which everything that is searched for is also found (Anderson, 2008, p. 219). His studies show that the Long Tail is quite lucrative economically (Anderson, 2008, p. 132), because the low storage and transaction costs are, with purely digital offers, extremely low. Significant additional business is created with products that are less in demand but are particularly easily available via the long tail.

“Free” (Anderson et al., 2009) is another phenomenon that Chris Anderson has studied. It describes digital offers that are free of charge and yet generate sales. It shows that low transaction costs and new revenue models lead to value-added services simply being given

away. Whatsapp, Facebook and Google Search, for example, are free of charge for the customer and generate revenues through the sale of data.

## **2.6 The winner takes it all**

According to Reiner Clement, winner's markets are characterised by "a dominant firm that has a multiple of market share compared to competing firms" (Clement et al., 2019, p. 239). Ilko Hoffmann summarises Clement's remarks and describes those three factors can trigger the phenomenon in the digital world: the network effect, economies of scale and the lock-in effect (Hoffmann, 2020).

According to Stähler, the phenomenon is additionally strengthened by the attention of multipliers (Stähler, 2002, p. 240). The more multipliers report about the business model, the faster the number of customers grows. The growth reaches critical mass and a self-reinforcing effect (Stähler, 2002, p. 241) sets in, consolidating the gap between the winner and the losers. A vicious circle begins.

James Clear points out that even small advantages can trigger this phenomenon: "Situations in which small differences in performance lead to outsized rewards are known as Winner-Takes-All Effects." (Clear) He even refers to this as the 1 per cent rule, because small differences accumulate into significant advantages.

## **3 METHODOLOGY**

The approach for this argumentative study is based on assertion, justification and examples. An intensive literature review found inconsistencies in classical strategy development. A deeper analysis of the causes reveals that Porter's theories are subject to the restrictions of a physical world.

Digitalisation has no clear contours, so a research design is chosen that shows as much contrast as possible between the analogue and digital worlds. In order to emphasise the argumentation, a physical good, which is offered in stationary sales, is contrasted with a comparable digital good, which is sold via a digital platform. The chain of argumentation often appears abstract to the reader, which is why the comparison is additionally illustrated with a prominent example from music distribution.

The justification of the established claim "digitalisation overrides Michael Porter's theories" is substantiated in the following successive steps: Example of music distribution, illustration of restrictions, illustration of operational efforts and comparison of Porter's theories and digital strategies.

## **4 RESULTS**

Michael Porter's theories are both superfluous and obstructive to the development of digital strategies because they are designed for an analogue world with physical boundaries. Digital strategies follow the principle of "the winner takes it all".

Porter's core strategies defend the position in the market through focus, cost leadership or differentiation. Platform-oriented business models offer the customer an endless supply and unbeatable convenience. Porter's strategic positioning becomes a disadvantage in an immaterial world.

#### 4.1 Example music distribution

This study focuses on digital goods and business models, which are contrasted with their analogue counterparts. The music platform iTunes (Apple Inc., 2021) is an ideal example of digital disruption. Music used to be sold on recordings. These were produced, distributed to retailers and sold individually in stationary stores. Today, music is a digital product that is offered for download or via streaming services.

The product music has been converted into a digital good and can be reproduced as often as desired without effort. The iTunes platform is a purely digital business model. It takes care of marketing, distribution, logistics as well as warehousing and accounting. The digitalisation of business models has enormous advantages for the customer: they are available at any time, accessible from anywhere and particularly easy to use (Bauriedel, 2017).

Further advantages arise regarding productivity (Varian, 2016). The three productivity factors change drastically and lead to an exponential jump in productivity. The output quantity is theoretically unlimited, because the product can be copied as often as desired without effort. The production factor material approaches zero, because music is now a digital good. The platform eliminates the operational work (Bauriedel, 2020b) in marketing, sales, production and logistics. The capital used to set up the platform is less than that used to set up a sound carrier production including a stationary distribution channel. Stationary music distribution is not competitive in the long term compared to the platform-oriented business model.

#### 4.2 Presentation of the restrictions

The consideration of the physical restrictions sheds light on the limited possibilities of the stationary trade compared to the digital business model. Salim Ismail describes this particularly aptly in his book *Exponential Organisation*: "An information-based environment creates fundamental disruptive opportunities." (Ismail et al., 2017, p. 14)

The classical music business is at a disadvantage. The reasons: Customers have to come to the shop, each purchase represents a time commitment, there are opening hours, there is a limited supply and the product may not be available at the moment.

The digital business model breaks down the physical boundaries. This is because the output quantity is arbitrary, the transaction costs approach zero and the possible reach is the entire market. Every product is available and every customer is served.

Tab. 1 – Illustration of the restrictions. Source: own research

Category	Stationary Music distribution	Music platform iTunes
Business model	Retail shop	Platform
Effort for the customer	high	minimal
Coverage	regional	global
Opening hours	limited	unlimited
Type of products	records/CDs	digital
Range of products	approx. 10.000 recordings	unlimited
Costs per transaction	high	minimal

The comparison of the business models shows that the core strategies according to Michael Porter do not make sense. On the one hand, the digital business model is superior to the stationary trade and will disrupt it, as has already happened. On the other hand, the new strategic target is not the small regional customer on the corner, but the entire market. Stähler emphasises, "The optimal production volume is the market." (Stähler, 2002, p. 197) In terms of

supply, the concept of the long tail dominates. iTunes has a supply of 70 million songs (Apple Inc., 2021). It is no longer about a favoured music genre, but about every song ever produced. What is the point of separating oneself from the market and defending one's position if the aim is to conquer the entire market?

### 4.3 Presentation of operational efforts

The presentation of the efforts clearly shows that the stationary shop requires a lot of manual work to fill the shelves, to advise customers, to put on music for trial listening, to cash up, etc. The analogue organisation is only scalable to a limited extent because the shop cannot be expanded at will. The shelves hold a limited amount of goods and only a few customers can be served at a time.

The digital business model is an internet application that runs on servers in the cloud and is scalable as desired and quickly. Manual work approaches zero, because the algorithms replace all employees. All operational processes are digitalised, which means that there is not a single employee who has to intervene manually in a transaction. Both manual and intellectual work has been eliminated. Individual manual activities remain in marketing (e.g. analogue campaigns), in purchasing (e.g. negotiating with suppliers) and of course in the maintenance of the IT infrastructure.

Tab. 2 – Illustration of operational efforts. Source: own research

<b>Funktions</b>	<b>Stationary Music distribution</b>	<b>Music platform iTunes</b>
Marketing	manual	manual /digital
Distribution	manual	digital
Warehousing	manual	digital
Purchasing	manual	manual /digital
Logistics	manual	digital
Cashier/accounting	manual /automated	digital
IT	manual	manual

Michael Porter's theories suggest that companies should focus on their core competencies. In our example, the stationary trade has its focus on music. iTunes does not need this competence because all the information necessary for distribution is uploaded by the supplier. Ultimately, the customer decides which music he likes or an algorithm creates hit lists and personalised advertising campaigns from it. The second core competence of the stationary music business is knowledge about the customer. Here, the platform has a clear advantage, because it records every transaction in detail, algorithms create preferences for each customer and generate highly personalised campaigns from this. The number of transactions, preferences and customers is irrelevant here.

All business functions that Porter lists as possible core competencies in the value chain are completely digitised at iTunes. Only one important core competence remains, technology. iTunes and all other internet giants are primarily technology companies, which have a downstream competence in books, credit, travel or music.

### 4.4 Porter's theories vs. digital strategies

The direct comparison shows that Porter's strategies are being superseded because different success factors apply in the digital world. Porter once wrote: "Being all things to all people, is a recipe for strategic mediocrity and below-average performance, because it often means that



a firm has no competitive advantage at all." (Porter, 1988, p. 12) iTunes, Spotify and other music platforms have ignored this advice.

The generic strategy, which represents a strong differentiation of the company against a potential competitor, has been invalidated. Digitisation, especially through digital goods and business models, means a leap in productivity that completely erodes the competitiveness of analogue organisations. In a free market, oligopolies form in the short term and monopolies in the long term (Krämer, 2019). The phenomenon is described as "the winner takes it all". Driving forces behind this phenomenon are, for example, the network effect (Clement et al., 2019, pp. 243–245) with Facebook, the long tail with Amazon and Free with Google.

Tab. 3 – Porter's theories vs. digital strategies. Source: own research

<b>Porter's theories</b>	<b>Practices of analogue organisations</b>	<b>Changed goals of digital strategies</b>
Generic Strategy	Positioning	The winner takes it all
Value Chain	Core Competencies	Value Proposition
Five Forces	Competition	Market Penetration

In contrast to differentiation from the competition, as Porter describes it, digital strategies are about acceleration, which leads to dominance. Two aspects are particularly important for this: firstly, market penetration, i.e. the speed at which the platform grows, and secondly, customer value. For the development of customer acceptance, business models are fundamentally rethought. With his Business Canvas model (Osterwalder & Pigneur, 2011), Osterwalder has developed a procedural method that is now accepted. One aspect of the canvas model is the value proposition (Osterwalder et al., 2015). In his model, Osterwalder has once again suggested a dedicated analysis of Pains and Gains. Porter's basic idea of defending one's competitive position is replaced by an aggressive forward strategy that focuses exclusively on the customer. Prices, costs and profits are often neglected, as the initial aim is to build up a critical mass that will later lead to dominance.

The value chain theory can be disregarded as it is subject to the complete digitalisation of all operational processes. While the analogue organisation focuses on factories, machines, employees and logistics capacity, the platform is highly dynamic. The business model can be adapted in a short time. Access to technology and speed of adaptation are the new competitive advantages.

The Five Forces lose their utility, because everyone is looking for the platform with the most customers. With high penetration, transactions increase, costs decrease and revenues increase. The musician can use any platform and every platform wants to market all musicians. Everyone tries to win everyone over. The formerly highly praised exclusivity in the supplier relationship becomes a deadly trap. Amazon has taken an impressive step here and opened up its trading place to third parties. Thus, the former online bookseller has once again drastically increased the offer and availability. Amazon Germany already offered its customers over 229 million products in 2017 (Brandt, 2017).

## 5 DISCUSSION

The discussion that emerges from this paper is the following: If the success factors of analogue and digital business models differ so dramatically, should we better prepare our leaders for them? Are our universities imparting outdated knowledge?

What good does it do an economy or a company if managers follow outdated doctrines and are unable to develop a digital strategy? Frey and Osborne found in their study (Frey & Osborne,

2013) that many advisory professions will be affected by digitalisation. We are talking about banks, travel agencies, cinemas, etc.

Where do the leaders come from who accompany this change and shape the digital transformation? Rogers (Rogers, 2003) has found in his research that the Innovation Diffusion Process is initiated by particularly innovative companies and within companies by cosmopolitan personalities, the champions. Therefore - in the author's view - universities should finally start teaching the new success factors. Because we need a digital elite to defend our prosperity. A study by Peter Sims (Sims, 2011) has shown that the leaders of the internet giants have preferably enjoyed an education that encourages them to think for themselves.

## 6 CONCLUSION

It would be too early to eliminate Porter's theories on strategic management from textbooks, but it is becoming clear that new rules apply in a digital world. Porter's theories are effective for the broad mass of analogue companies. For decades, his approaches have inspired and guided managers in their actions. But now that a fourth industrial revolution (Schwab, 2016) has begun, it is necessary to adapt to the new rules (Bauriedel, 2020a). The problem is that Porter's theories have manifested themselves in people's minds and rethinking seems impossible. The digital revolution is already somewhat reminiscent of the time when science was challenged by Copernicus' heliocentric worldview or Darwin's theory of evolution. An exciting time for new thoughts!

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# MEASURED DETERMINANTS AND MEASUREMENT METHODS OF NEW TECHNOLOGIES-BASED FIRMS' SURVIVAL AND GROWTH

*Veronika Bednářová*

## **Abstract**

The basic of new technologies-based firms (NTBFs) is to generate innovative technologies, turn them into value and utility for the customer and contribute to economic growth. To have a chance to exploit their potential, they need to survive and grow. That is the reason why there is an increasing researchers' interest in determinants influencing their survival and growth. The main aim of the paper is to provide a systematic literature review to summarize and analyze current approaches in examining determinants of NTBFs' performance, development, survival, and growth, to discuss the research gap in this area and the potential for improvement of such research in the future. Such results could be useful for the scholars who study the term NTBF and are interested in how to bring more clearness to their survival and growth. The result of such a systematic literature review presenting researched determinants, samples, data collection, and data analysis methods enables a compilation of an appropriate research tool for understanding and addressing them. To the most examined determinants belong personal determinants, commercialization, funding, business model, capabilities, networks, and partners. Future research in this area should also pay attention to the originality of the technology alone, to competition from not only technological capability but also economic capability, business environment, and industry. The analysis of the NTBFs' survival and growth determinants literature overview shows that there is a need for a careful selection sample based on an original technology and appropriate research should combine face-to-face interviews with publicly available data for data collection and both quantitative and qualitative approaches for analyzing the data.

*Keywords: new technologies-based firms, growth determinants, data collection, data analysis*

## **1 INTRODUCTION**

New technologies and innovations are becoming crucial for the development of the economy and society. They contribute greatly to long-term sustainable economic growth. New technology-based firms (NTBFs), which are usually from the category of small and medium-sized enterprises and mature startups (scale-ups) have technology as a dominant feature. They are companies, which acquire an important national economic role. They are generators of employment and creators of social progress. They make a significant contribution to the development of regions by the creation of skilled jobs and developing new products and processes. In some cases, they are also founding new business sectors and opening new markets.

However, new technologies-based firms are hampered in performing this macro economical role. Despite the dynamism, innovativeness, and advanced technology, many of these companies are dealing with the commercialization process. They often cannot turn breakthrough technologies into business earnings. The commercialization process of innovative technology stands as a critical entrepreneurial activity leading to business growth. It is necessary to understand that the base of business success lies in the ability to transform technological capabilities into valuable products and service offerings.

Companies based on new technologies often lack the resources, capabilities, and competencies to successfully commercialize their technologies. This fact limits their business growth and

even threatens their market survival. The business growth of these companies is usually long and slow, which does not correspond to the quality of invented technology and high competition in the technological industry. In this context is shown the importance of a deeper knowledge of the specifics of NTBFs, which needs to be examined at all stages of their development. It is necessary to identify and analyze which determinants affect the growth of the new technologies-based firm, to reveal the relationships between them and the interrelationships through addressing the solving of complex tasks, such as how the originality of technology, how to turn technology into value and utility for the customer, how to ensure accelerated to exponential growth on an international scale, how to cooperate with scientific and business partners and how to build a company in terms of personnel, processes, and finance and formulate its business strategy and clarify which of these determinants hinder their development and which help them to develop. This clarification requires compiling an appropriate research tool for understanding and addressing them.

The paper is organized as follows. Section 2 presents a summary of the new technologies-based firm's definition in the literature and shows their importance and contribution to the macroeconomic level. Section 3 describes the main aim, the partial aims, and the research methodology. Section 4 presents the results of the paper which is the summarization of so far examined NTBFs' growth and survival determinants, and used methods of data collection, and data analysis by researchers. Section 5 is a discussion of the findings and recommendations for future research.

## **2 THEORETICAL BACKGROUND**

### **2.1 Definition of new technologies-based firms**

Even though the term new technologies-based firm is the object of researchers' interest for decades, there is still no explicit definition, and a lot of heterogeneity is observed. Arthur D. Little Group (1977) provides the first definition of NTBFs as an independently owned company, which is established for not more than 25 years and based on the exploitation of an invention or technological innovation that implies substantial technological risks. Luggen and Tschirky (2003) consider as NTBFs all firms working in a high-technology sector, established in less than 10 years, and led by the original founder team. Hogan and Hutson (2006) characterized NTBFs are a subclass of high technology firms. Grilli and Murtinu (2011) define them as young and high-tech start-ups. Piccarozzi (2017) defines NTBFs as companies using scientific and technological knowledge for systematic and continuous production of new goods or services with high added value. NTBFs usually operate in top-level strategic sectors, such as microelectronics, biotechnology, medical devices, and nanotechnology. Camisón-Haba, Clemente-Almendros, and Gonzalez-Cruz (2019) highlight their operation in technology-based industry and the development of innovative value propositions.

The definition of the term is considered as the methodological dilemma based on the majority of studies. It appears that there is not a universally accepted definition of NTBFs, as researchers tend to emphasize different aspects of these companies and concept their researched sample uniquely. From a standpoint of Buganza, Gerst, and Verganti (2010) NTBFs pay attention to managing their development processes by management of technology, management of the new development process, and management of competencies. Ganotakis and Love (2011) underline uniqueness of them, mostly because of their high-growth and high-innovation nature which makes them differ from other companies. From another point of view, they face different challenges in getting their highly innovative products to market. Saemundsson and Candi (2017) stress the newness of these companies and the intensity of internal research and development. Based on Fudickar, and Hottenrott (2019) NTBFs typically compete in

knowledge-intensive industries characterized by rapid technological change. That is why these companies require continuous investments in skilled personnel and equipment with high asset specificity. Contreras and García (2021) claim that these companies are the preponderance of intellectual work, technology, and innovation systems.

Another potential for confusion brings the newness, because it is not obvious whether ‘new’ refers to the technology or to the firm. Candi and Saemundsson (2008) try to clarify the dilemma about the newness of NTBFs and define them as new firms that are based on technology, whereas the technology may or may not be new. In their research, they state that NTBs are likely to be sensitive to coercive isomorphism, mimetic isomorphism, and normative isomorphism. Coercive isomorphism means that culture, government, and other organizations influence their creation and design. Mimetic isomorphism is based on the uncertainty of technology development, newness, and market environment which are drives of mimic other companies. Normative isomorphism stems from the professionalization and proportions of the educational background of human capital.

Other researchers try to identify the term through the content characteristic of these companies. Torrecilla García, Skotnicka, and Zamora (2015) specify the three main aspects of NTBs which are independent firm property, technology-based strategy, and new or recent creation. The authors emphasize that NTBFs are usually praised for high innovativeness despite the resource constraints and the liability of newness. Ng and Hamilton (2016) examined drivers and obstacles to the high growth of these companies. Based on such research the main strengths are innovativeness, customer-focused flexibility, commitment to research and development, and employee engagement. Innovation is the new technologies-based firms’ signature and critical capability. The technology industry is highly competitive, that is why the products or services need to be differentiated. Required is also customization and continued ability to respond quickly to opportunities and threats. These companies invest continuously to develop their innovation capability. The companies in this research claim, that they supported employee engagement and valued their suggestions for improvement. New technology-based firms strive to create the new market potential for product development and technology advances. Their opportunities lie in the creation of market potential and new technology or product development. The main weaknesses of these companies are related to the smallness and the newness, lack of human capital, lack of external collaboration, and lack of funding. These companies are influenced by competitive pressure. They must compete in dynamic environments, where competitors create markets through innovation. The issues connected to the intensity of competition in the fast-changing markets, smallness, human capital, and funding seams to weaken the link between innovation capability and growth performance. Boudlaie, Kenarroodi, and Nik (2020) identified the five characteristics of NTBFs which are newness, possessing high technology, independence in the sense of capital funding by company founders, and small size in terms of employees and volume of sales, and characteristics of human capital and founding team. The newness refers to the date of their establishment, which generally, ranges from one to ten years. There is also the newness of the technology and the emergence of the new industry. NTBFs focus on the exploitation of new technological knowledge. High technology is a characteristic emphasizing the development, use, and dissemination of advanced technologies and knowledge. These companies are mostly small and medium enterprises, with a characteristic of size is by EU definition given by the number of employees and annual sales or annual balance sheet total. In this case, they can have a maximum of 249 employees and sales less than 50 million €, or their annual balance sheet total should be less than 43 million €. Most capital belongs to founders and is managed independently; they are not subsidiaries like for example multinational companies. Founders and human capital represent a

competitive advantage of these companies, they are characterized by a high level of qualification.

## **2.2 New technologies-based firms' survival and contribution to socio-economic development**

Socio-economic development can be interpreted as changes taking place in the social sphere, based on an economic nature. Any economic phenomenon cannot be completely isolated from social aspects. Technological knowledge of NTBFs is the basis of macroeconomic growth and competitiveness of the country which has already exhausted the driving forces of production and investments and now has to focus on innovation.

Zapata Huamaní, Fernández López, Neira Gómez, and Rey Ares (2017) state that companies based on new technologies are important for the long-term development and growth of the economy through employment, research, development, and innovation. These companies help to convert innovative ideas into economic opportunities, generate competitiveness, create employment, and increase productivity. Coad and Reid (2012) present other benefits of NTBFs including new processes and products, knowledge spillovers, human capital formation, productivity growth, and reduced environmental damage or resource depletion. The authors emphasize that technology may improve job satisfaction and life satisfaction in ways that cannot be easily measured in economic terms. The research by Choi, Sung, and Park (2020) implies that technological innovation has a positive effect on the quality of employment because innovative activities lead to the creation of high-quality employment.

Despite this, many of them will not succeed in the market during the first years. Ramaciotti, Muscio, and Rizzo (2017) state that many of them exit the market at the beginning of their life cycle when they are still young and small. Rannikko, Tornikoski, Isaksson, and Löfsten (2019) offer interesting findings because it seems the survival rates are much higher compared to the traditional belief of high mortality rates among new companies. Their empirical observations by them show that 72% of NTBFs from 2006 were still in operation at the end of 2014 and surviving companies positively affected employment. Their annual job creation was higher than the reduction in employment caused by exiting companies. Very few companies experienced high growth during their first seven years, and employment growth and sales growth were highly correlated among high-growth companies. Ungerer, Reuther, and Baltes (2021) point out the fact that in some research there are included companies that are inactive while still classified as surviving based on the available data. The authors found out that only 3 of 133 quantitative studies concretely consider inactive companies. Their recommendations are taking the data source, the period under investigation, and the sample size into account. Research from Ejermo and Xiao (2014) examined the survival of NTBFs established in Sweden from 1991 to 2007. They found that these companies experience a lower hazard rate compared to other companies that authors interpreted as a sign of the high-quality technology. On the other hand, they found a higher sensitivity to business cycle fluctuations in NTBFs.

A Polish study from Zbierowski (2017) examines the possible impact of NTBFs on the social and economic development of Central and Eastern European (CEE) and Commonwealth of Independent States (CIS) countries by analyzing data on their expected growth, innovativeness, and internationalization. The study provides a diverse and comprehensive view of the ability of NTBFs to social and economic development and contributes to forecasting the future effects caused by NTBFs on the economy. 628 entrepreneurs declared using the newest technologies (technologies up to one-year-old) while 1,102 reported using new technologies (between one to five years old). The rest, 3,453 TEA entrepreneurs, declared using technologies invented more than five years ago. There is a great variety in the shares of early stage (up to 3.5 years of activity) NTBF owners ranging from 0.7% (Russia) to almost 5% (Slovakia, Romania, and



Kazakhstan). That difference might have a serious impact on the capacity of high-tech new ventures to affect economic and social development. Moreover, when combined with the growth potential of NTBFs, the impact might even be magnified. For instance, if the growth projections for the three countries with the highest shares of high-tech venture owners in society (Slovakia, Romania, and Kazakhstan) are met, then NTBFs would create jobs for about 60–70% of the population over the next five years (compared to about 4% in Russia). This, of course, is not realistic because such projections are highly overconfident and there is also a high potential for failure among NTBFs, according to Navis, and Ozbek (2017). The combination of the number of high-tech ventures and their growth aspirations point to huge differences in the capacity for job creation among the various CEE and CIS countries.

Understanding the contribution of these companies to the economic system requires identifying and analyzing determinants influencing their survival and growth. Society generally expects that technology is the automatic precondition of business success. The truth is that even a breakthrough technology cannot certainly secure business earnings and customer acceptance. Candi (2010) supported this and claims that differentiation based on technology alone is not sufficient to ensure success in innovation.

### **3 METHODOLOGY**

The main aim of the paper is to compile a research tool for the understanding of the NTBFs' resources, processes, and reasons, purposes, motives of the founders and the team of companies based on new technologies. The main goal has been chosen to address the examination of determinants of building a technologically innovative company, making this company competitive in the market environment, and ensuring its development and growth.

The main aim is specified through two partial aims:

1. To explore and identify the key determinants of NTBFs 'survival and growth for examination.
2. To explore and analyze appropriate research methods for the examination of the key determinants of NTBFs 'survival and growth.

To fulfil the main aim and partial aims of the paper, firstly the literature review of the definition of NTBFs was conducted to address the main characteristics of such companies and present dilemmas connected to their definition. In concern to the depiction of these companies also in the macroeconomic context, another step was to study and presents their contribution to social, cultural, and economical progress. At the same time, the paper pays attention to the fact that this contribution depends on their survival and growth. Among these companies, there is a huge probability of failure due to further examined issues. The paper provides a compilation of research tools in context with the identification of NTBFs' survival and growth determinants, and research methods of data collection and data analyses for the examination of these determinants. In this part of the paper was used a systematic literature review of 36 researched articles. The articles were chosen based on a previous set of criteria. The criteria were the publication date, which must be during the period of 2010 and 2022 to catch the relevance and topicality, and the citation of the article to cover the well-known researchers in the area. The researched articles were mostly chosen from the ones indexed in the Web of Science and Scopus databases, as the most relevant databases. It took one year to collect the articles, chose the appropriate ones based on the previous set of criteria, and analysed them. The systematic literature review is the type of review that helps to develop theoretical models, highlights gaps in the literature, shows a new perspective, and suggests recommendations for future research. The main advantage of this method is the ability to combine both quantitative and qualitative approaches. A systematic literature review in this paper is used to uncover which determinants

of NTBFs are the objects of interest in current research. It presents what is measured in context with NTBFs' performance, development, survival, and growth and how is it measured to summarize the current state of knowledge. Then, analyze the findings, address them, and compare them with statements of other researchers, find the research gap, and finally lead to suggestions for future research in this area.

## 4 RESULTS

NTBFs are very specific companies. These companies are important sources of technological innovation, they develop new products and services, and they are bearers of socio-economic progress. At the same time, NTBFs may not take advantage of their potential due to resource constraints and other determinants that affected their survival and growth. Recognition of their innovative potential together with the above-discussed fragility of them stimulates the economic research concentrated on the determinants of their creation, development, performance, survival, and growth.

I report the results of a systematic literature review presenting researched determinants, data samples, data collection, and data analysis methods of NTBFs in the past 22 years published 36 researched articles by well-known researchers in this area in Table 1. The period was chosen because most articles relevant in this area were published in this time interval. Relying on this time interval there is the most possibility to catch and cover the most recent articles published by the most cited researcher in the research area. Specificity of NTBFs in this context is the small size of the team, the need for a skilled workforce, and the fact that the founders and team usually start a business with technological education and experiences, not economic, business, or management ones. That is one of the reasons why the important role in NTBFs play networking, partnership, cooperation, and ecosystem. Arantes, Caetano, Paula, and Freitag (2019) state that networks enable the improvement of skills and technological knowledge, a reduction in uncertainty, and the provision of a range of benefits that the NTBF alone would not possess. NTBFs must deal with resource gaps, in the sense of human capital, capabilities, and funding. Based on Grilli, and Murtinu (2018) because of difficulties in accessing complementary assets these companies often need to pursue their growth and innovation strategies. Another point of interest of researchers examined NTBFs are business model and commercialization of technology. Transform technological innovation into a product or service is hard to realize. Successful commercialization is a massive challenge for these companies but focusing on it may accelerate business growth. Arantes, Caetano, Paula, and Freitag (2019) found that business growth is even more related to business model design and marketing competencies than technology. The data samples differ from one research to another. It depends mostly on the method of data collection, if it is a publicly available database or online questionnaire, the samples are bigger, and if the data are collected through interviews, it is smaller. It is shown that most frequently, the researchers rely on data collected through online surveys or databases. The results of the examination in the analyzed research articles are usually processed by employing descriptive statistics to identify mean values and extreme values from the same set of data on the companies surveyed. The use of the descriptive statistics method makes it possible to identify the examined sample through the individual data of the individual companies and the mean values necessary for the objectivity of the facts examined. The studies and research are frequently used to evaluate the results of statistical methods of regression analysis and correlation analysis. Regression analysis will examine the relationship between two or more variables through a regression model. We assume that the dependent variable depends on another independent variable or variables. In the correlation analysis, the intensity of the interdependence between the variables will be examined using the correlation coefficient. Another used method is the Partial Least Squares regression (PLS), which reduces the

variables, used to predict, to a smaller set of predictors, then is used to perform a regression. Other usually used methods are cluster analysis and factor analysis. Cluster analysis is a general logical procedure, formulated as a procedure by which objects are merged into groups - clusters, based on their similarity and difference. A cluster is a group of objects whose similarity is greater than the similarity of the objects that do not belong to the cluster. Factor analysis is a method that identifies interrelated variables based on the interrelationships between variables. From only those variables that are closely related, it creates factors, thus reducing a larger number of variables to fewer factors.

Tab. 1 – Overview of determinants of NTBFs ‘performance, development, survival, and growth in literature

Source: own research

Determinants	Resources	Size of sample	Data collection method	Data analysis method
<b>Founder and team, Knowledge</b>				
The effect of knowledge resources stemming from the founding team’s human capital size, experience, education) and the access to external sources of knowledge (tacit or explicit)	<i>García-Cabrera, García-Soto, Nieves (2021)</i>	175 NTBFs	Online questionnaire, SABI database	Descriptive statistics, Correlation analysis, Regression analysis
Key motivation drivers by founders and employees	<i>Soñta-Dręczkowska (2020)</i>	26 NTBFs	Face-to-face interviews	Content analysis procedure
Intrapreneurial behavior of employees	<i>Badoiu, Segarra-Ciprés, Escrig-Tena (2020)</i>	1 NTBF	Questionnaires., Interviews	Case study
The fit between the chosen technology strategy and the entrepreneur’s resource	<i>García-Cabrera, García-Soto, Olivares-Mesa (2019)</i>	175 NTBFs	Questionnaire	Factor analysis, Descriptive statistics, Regression, Correlation
Non-founder human capital (number, education, experience, skills)	<i>Siepel, Cowling, Coad (2017)</i>	202 high-tech firms	Questionnaire	Descriptive statistics, Multinomial logit model
The role of entrepreneur (gender, age, education, employment status, national income bracket, entrepreneurship skills, knowing entrepreneurs)	<i>Zapata Huamani, Fernández López, Neira Gómez, Rey Ares (2017)</i>	GEM Database entrepreneurs of NTBFs	Global Entrepreneurship Monitor (GEM)	Descriptive statistics, Logistic regression
The role of entrepreneurs’ general and specific human capital education and experience	<i>Ganotakis (2012)</i>	412 NTBFs	Questionnaire	Robust standard errors (RSE)
Individual characteristics such as technical, procedural and managerial skills, motivation	<i>Fini, Grimaldi, Marzocchi, Sobrero (2012)</i>	133 NTBFs	Face-to-face interviews	Structural equation modeling approach (SEM)

Financial management competence of founding teams	<i>Brinckmann, Salomo, Gemuenden (2011)</i>	212 NTBFs	Questionnaire via phone	PLS (Partial least squares) methodology
Teamwork capability and relational capability of the entrepreneurial team	<i>Brinckmann, Hoegl (2011)</i>	212 NTBFs	Online questionnaires	Correlation analysis, Regression analysis
Team formation	<i>Dautzenberg, Reger (2010)</i>	1,834 NTBFs	Data from the commercial agency Creditreform	Descriptive statistics, Group comparison
<b>Capabilities and processes</b>				
Intellectual property rights and innovation capability	<i>Acosta-Prado, Sanchís-Pedregosa, López-Montoya, Sanabria-Landazábal, Tafur-Mendoza (2020)</i>	102 NTBFs	Emailed instrument	Exploratory factor analysis
Innovation capability, Knowledge management	<i>Acosta-Prado, Romero Severiche, Tafur-Mendoza (2020)</i>	102 NTBFs	Questionnaire	Exploratory factor analysis, Confirmatory factor analysis
Resilient organizational capabilities	<i>Bueno Campos, Murcia Rivera, Merino Moreno (2019)</i>	20 NTBFs	Questionnaire, Interviews	Case study
Exploration capabilities, Exploitation capabilities	<i>Jensen, Clausen (2017)</i>	97 NTBFs	Questionnaire	PLS-SEM analytical tool
Problem absorptive capacity, Solution absorptive capacity	<i>Saemundsson, Candi (2017)</i>	103 NTBFs	Face-to-face interviews	Descriptive statistic, Correlation, Regression
Technological capabilities	<i>Acosta-Prado, Longo-Somoza (2013)</i>	5 NTBFs	Interviews and secondary sources (reports, websites, magazines...)	Analysis
Organizational identity		68 NTBFs	Questionnaire	Factor analysis
<b>Commercialization</b>				
Commercialization strategy	<i>Symeonidou, Bruneel, Autio (2017)</i>	232 NTBFs	Data from the Kauffman Firm Survey	Descriptive statistics Correlation, Regression
Marketing capabilities	<i>Qureshi, Aziz, Mian (2017)</i>	253 NTBFs	Questionnaire	PLS (Partial least squares) methodology
Influence of market and technology orientation	<i>Giones, Miralles, König, Baltés (2015)</i>	249 NTBFs	Data from the Kauffman Firm Survey	Descriptive statistic, Regression
<b>Business model</b>				
Business model CANVAS	<i>Isaksson, Löfsten, Rannikko (2021)</i>	589 NTBFs	Databases and registers, Questionnaire	Descriptive statistic, Correlation, Regression
Internal resources (business experience and growth orientation)	<i>Rydehell, Isaksson, Löfsten (2019)</i>	401 NTBFs	Questionnaire by phone using an	Principal component analysis,

and External resources (proximity and R&D networks)			external service (TNS-Sifo)	Correlation analysis, Regression analysis
Effectuation and causation in business model development	<i>Reymen, Berends, Oudehand Stultiëns, (2017)</i>	4 NTBFs	Interviews, Archival documents	Analysis, Comparison
Initial configurations and business models	<i>Rydehell, Isaksson (2016)</i>	8 NTBFs	Interviews	Analysis
<b>Capital structure, Financing</b>				
Mobilising finance	<i>Rannikko, Buffart, Isaksson, Löfsten, Tornikoski (2022)</i>	303 NTBFs	Telephone-based survey questionnaire by TNS-Sifo	Correlation analysis, Regression analysis
Capital structure	<i>Kedzior, Grabinska, Grabinski, Kedzior (2020)</i>	31 NTBFs	The stock exchange data	Regression analysis, Correlation analysis
Corporate Governance and Capital structure interactions	<i>Corsi, Prencipe (2015)</i>	303 NTBFs	AIDA - Bureau van Dijk database	Mixed model procedure in SPSS 21.0
The role of public (and private) venture capital	<i>Grilli, Murtinu (2011)</i>	1 984 NTBFs	VICO dataset	Descriptive statistic, Econometric models
<b>Cooperation, Ecosystem, Partnership, Networking, Support</b>				
The importance of the network of collaborations with other firms, research institutions, and business associations	<i>Scandura, Bolzani (2020)</i>	140 NTBFs	Face-to-face interviews	Probit regressions with robust standard errors
The roles of external stakeholders	<i>Rydehell (2020)</i>	2 NTBFs	Semi-structured interviews	Case description
Business networks and localization effects	<i>Rydehell, Isaksson, Löfsten (2019)</i>	401 NTBFs	Retriever Business database, Telephone through TNS-Sifo: The National Institute for Consumer Research)	Principal component analysis (PCA), Correlation analysis, Regression analysis
Direct interactions with public research institutions	<i>Fudickar, Hottenrott (2019)</i>	2 879 NTBFs	Computer-aided telephone interviews	Descriptive statistics, Probit models
Effects of Science Parks	<i>Ramírez-Alesón, Fernández-Olmos (2018)</i>	1 933 NTBFs	Data from Spanish Technological Innovation Panel (PITEC)	Descriptive statistic, Regression, Probit model
Interorganizational trust in key partner relationships	<i>Bruneel, Spithoven, Clarysse (2017)</i>	59 NTBFs	Face-to-face interviews	Descriptive statistics, Correlation, Cluster analysis in STATA 13
Transaction relation-based value network maturity	<i>Ungerer, König, Baltés, Maki (2017)</i>	170 NTBFs	Database	Descriptive statistics, Regression, Cox

				model survival analysis in STATA
Hard (financial-type support such as loans and grants) and Soft (counselling and business advice services) support entrepreneurship policies	<i>Ramaciotti, Muscio, Rizzo (2017)</i>	80 NTBFs	Database	Descriptive statistics, Event history analysis (Cox regressions)

## 5 DISCUSSION

NTBFs are bearers of innovation progress, to release, maintain and develop it, it is necessary to understand which determinants influence their performance, survival, and growth and how could we measure them. There is a summarization of so far examined determinants in the presented overview of current literature and the determinants which do not occupy a significant place in research papers so far, but are important in this context and have the potential to advance knowledge of NTBFs in the future:

- First, the most important precondition of NTBFs ‘performance, development, survival, and growth which is a little bit missing in research articles, is the technology alone. If a company invests in the wrong technology, the investment cannot be recovered. That is why the researchers should pay appropriate attention to the originality and business potential of the technology.
- Because, technology alone is not a guarantee of success, commercialization is huge part of the research. The research deals with how to effectively transform the technology into a valuable product and achieve product-market fit and which problems are complicated this way.
- Personnel factors related to the subjective and objective characteristics of human resources greatly influence NTBFs. The dominant position is acquired by the founder (entrepreneur), his expertise, age, gender, education, experience, as well as character, ambitions, personality traits, contacts, and especially the ability to persuade, activate the company, and arouse enthusiasm. Another key role also plays the team. Examined factors connected to a team are communication between them, collaboration, cooperation, motivation, flexibility, adaptability, homogeneity, or heterogeneity.
- Huge attention by researchers is dedicated to the wide range of capabilities of NTBFs, such as problem-solving, resilience, adaptability, innovativeness, internationalization, and ambidexterity. From the mentioned capabilities should these companies benefit, but the object of research in such area is usually concentrated on why they do not benefit from them.
- As mentioned, the resource gap connected to NTBFs makes them dependent on partners, networks, science parks, and incubators. The examined are their roles, their effect on the performance of NTBFs, interactions, and relationships with them. The fundamental part of their survival and growth is also funding, most often by business angels or venture capital. In the theme of funding, there is mobilizing financing, capital structure, resources of finances, and obstacles connected with it.
- Many of these determinants are an essential part of the business models of NTBFs. Business models with all key dimensions, their development, and innovation also attract the interest of researchers.

- Research gap lies in competition from not only technological capability, but also economic capability, business environment and industry, external growth opportunities, internal reasons, and conditions of growth.

The consequences of the examination phenomenon depend primarily on data. There are two main problems connected to data, the size of the sample and the collection of data. To use statistical methods, the researchers need to collect data on larger samples. Important is not only the size, but the representativeness of the sample in all populations of NTBFs concerning researchers in advance set on rules. The key problem starts here because in many states there is not a large sample of companies based on breakthrough technologies, which should be considered as NTBFs. In the majority of overviewed studies and research, the sample is just technological companies, without having any knowledge about the newness or exceptionality of technology. Using more specific definition of NTBFs usually leads to necessity rely on national databases for data collection. In comparison, Ganotakis (2012) would like to use official national statistics, but they were not available. According to him this fact makes the use of a narrow definition practically impossible, which corresponds to the previous statement. Collecting relevant and plausible data on the topic of NTBFs is difficult. Gaining access to a larger amount of primary data from founders and teams is challenging in the modern too busy world and relying on secondary data loses validity in such changing technological environment.

From the summarization of research articles on determinants that affected performance, development, survival, and growth of NTBFs and their analysis, most of the research and studies collected data mainly from freely available sources and statistics, from experiences and assumptions. The empirical research is lacking or insufficient. The research carried out so far was mainly based on publicly available data, and online questionnaires and either remained at the level of case studies or used statistical methods of evaluating the results of the examination, which did not achieve sufficient relevance due to the depth and plausibility of the data obtained. In contrast Ramírez-Alesón, Fernández-Olmos (2018) claim, there is no need to worry about in database sample selection issues, because of its longitudinal nature, which ensures a consistent representation over time. The added value lies in the field research with an emphasis on personal contact and authentic statements. By conducting face-to-face interviews with founders, CEOs, or founding team members who are assumed to be knowledgeable, the researchers could ensure a higher level of validity. Based on Saemundsson, Candi (2017), collect data via face-to-face interviews decreases the likelihood of collecting deviant or frivolously reported data. An appropriate way is to combine face-to-face interviews with external data obtained from external sources, such as databases, Finstat, articles, websites, and public interviews so that a sufficiently broad and undistorted picture of the object of research can be obtained.

Today, most research are relying on quantitative analysis. There is a trend of large samples which allows researchers to include more variables in the analysis. In the social and economic sciences, qualitative approaches to interpreting variation should be used as well as quantitative approaches in precisely placing cases relative to one another. The nature of NTBFs research is also qualitative. Qualitative research fits well with studying new and underexplored phenomena which are hard to measure. These corresponding determinants affected the development and growth of NTBFs. Qualitative research goes beyond just exploring them. Both quantitative and qualitative approaches have their strengths and weaknesses. To gain a richer understanding of determinants, reveal the relationships between them and the interrelationships, get deeper insights of data and by extension of examination, mixed method approaches are the best option. In some of the analyzed researched articles there is used method Partial Least Squares regression (PLS), recently the interest turns to alternative fuzzy-set Qualitative Comparative Analysis (fsQCA). Pappas, and Woodside (2021) findings from the fsQCA and the PLS-SEM, emphasize how the two methods are complementary, but more importantly how we can get more insight

into the dataset by employing fsQCA. FsQCA is a tool that combines aspects of both quantitative and qualitative approaches.

## 6 CONCLUSION

What to measure on the examination object and how to measure it, is and always will be a massive research dilemma. This paper is focusing on new technologies-based firms, which are expected to be a source of innovation, and stand behind the emergence of new industries, to ensure not only economic, but also social, cultural, and even civilizational progress.

It is different to examine a traditional company in a mature industry that has already established a business position and has a clearly defined vision and goals and to examine a technologically new company in a dynamic industry, with blurred visions and goals that are usually established by entrepreneurs without economical or managerial experiences. It required different research approaches. The main aim of the paper was to summarize and analyze current approaches to examine NTBFs and determinants of their performance, development, survival, and growth, to discuss the research gap in this area and the potential for improvement of such research in the future to compile an appropriate research tool for understanding and addressing them. Based on this paper, the examined determinants are personal determinants connected to the founder (entrepreneur) and team, commercialization, funding, business model, capabilities, networks, and partners. The research gap and opportunity for future research in this area lie in the originality of the technology alone, in competition from not only technological capability but also economic capability, business environment, and industry, in the examination of internal conditions of growth and external growth opportunities.

The choices of data collection methods and methods of data analysis are dependent on research questions and research objectives. Nonetheless, researchers must deal with issues, like various sample size limitations, reliability, and validity of collected data, and sometimes also with their knowledge of specific tools and methods. Researchers should renew their methods and tools knowledge base, there are a lot of research articles dedicated to new methods of analysis and practical guides for researchers on how to employ them. There are also articles about which approaches, and methods are suitable for the researched phenomenon. Making own systematic literature review of data collection methods and data analysis methods, like the one presented in this paper, can be very helpful too. The overview of realized studies result in the need for careful selection of original new technology-based firms' sample and that the best way is to combine face-to-face interviews with publicly available data and use both quantitative and qualitative approaches in analyzing them.

The paper has also some limitations and the presented results need to be interpreted with some caution. Important limitations relate to the quantity of examined research articles and studies and the period of their publication. In order to interpret the paper correctly, we should be aware of the fact that every country in which the NTBFs are set in has other conditions in the way of market development, which influence the size of the sample, subsequently affecting methods of data collection and data analysis.



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# DOES THE LABOUR MARKET REQUIRE GRADUATES WITH ENVIRONMENTAL KNOWLEDGE?

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## **Abstract**

The presented paper deals with the position of graduates, namely the university students, with environmental knowledge on the labour market.

The aim of this paper is to describe the position of graduates with environmental knowledge working in a selected enterprise, whose activities are part of the so-called green economy. The subject of the research represents a manufacturing enterprise in the South Bohemian region with approximately 400 employees in the Czech Republic. The survey methods are based on a qualitative approach. In late 2021 and early 2022, a series of semi-structured interviews were conducted with managers of the enterprise. The outputs are coded using Grounded Theory by Strauss and Glaser. Conclusions are drawn to describe the issue of graduates with environmental knowledge in the context of the green economy.

The results confirmed the relevance of graduates with environmental knowledge in the labour market in the context of the green economy. As such, environmental knowledge should always be combined with economic or technical knowledge. According to the managers, there is an unbalanced situation in the labour market concerning graduates with environmental knowledge, where there is more labour supply than demand. For the future development of environmental education, but also education in general, more emphasis should be placed on university–enterprises cooperation in terms of preparing future employees.

**Keywords:** *environmental knowledge, graduates, green economy, grounded theory, labour market*

## **1 INTRODUCTION**

The second half of the 20th century was significant due to the growth of environmental awareness across society. A number of important publications (e.g. Meadows & Club of Rome, 1972; World Commission on Environment and Development, 1987) pointed to the mismatch between exponential growth and the abundance of natural capital. The most obvious factor was pollution and the unsustainability of natural resource extraction. The environmental problems were gradually compounded by the great recession in 2008. At this time, the concept of the green economy emerged as a tool to restart growth, this time so-called green growth. Such tool is based on renewable resources and a shift away from fossil fuels (Barbier, 2009).

According to UNEP (n.d.), a green economy can have the following characteristics: low carbon, resource efficient and socially inclusive. Public and private investment in economic activities and infrastructure represent the key, which will in turn increase the energy efficiency and reduce the environmental burden. UNEP (2011) states that the green economy does not aim to replace the concept of sustainable development. On the contrary, it is more a matter of raising awareness of developments at national, regional, and global levels in the context of the implementation of Agenda 21.

Based on the publication *The inclusive green economy in EU development cooperation* (European Commission, 2018), the circular economy is part of the green economy. It emphasises the need to channel investment in both natural capital and circular economy principles. The purpose is not only to meet environmental goals, but to achieve sustainable

economic growth and, in particular, to create green jobs. According to Ellen MacArthur Foundation (n. d.), the circular economy can be defined as a systems solution framework that tackles global challenges like climate change, biodiversity loss, waste, and pollution.

Elements of the green economy often complement the Corporate Social Responsibility (CSR) already established at the corporate level. The European Commission (2011) describes CSR as the responsibility of companies for their impact on society. At a general level, CSR for businesses is defined within the framework of ISO:26000:2010, which describes the concept as directing company's activities towards the achievement of sustainable development goals (ISO, 2010). Sustainable development is seen as an alternative development paradigm to the existing neoclassical one. It was defined in 1987 by the World Commission on Environment and Development as follows: “*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs*” (World Commission on Environment and Development, 1987).

Green jobs are a visible sign of the green economy, and their creation and number represent a monitored indicator of the successful application of the concept. They are defined as “*work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute substantially to preserving or restoring environmental quality*” (UNEP, 2008).

The aim of this paper is to describe the position of graduates with environmental knowledge in a selected enterprise, whose activities are part of the so-called green economy. The survey methods are based on a qualitative approach – semi-structured interviews were used. The outputs are then coded using Grounded Theory and conclusions are drawn to describe the issue of graduates with environmental knowledge in the context of the green economy.

## **2 THEORETICAL BACKGROUND**

A number of studies deal with the issue of green jobs and especially with the factors that influence their emergence. Moreno-Mondéjar et al. (2021) describe the impact of the application of the principles of circular economics on the emergence of new green jobs through strategies involving circular economics and the principles of 4R (reduce, reuse, recycle and redesign). Overall, based on the results, it can be stated that both factors have a positive effect on the number of green jobs. These are, in particular, procedures aimed at reducing costs and increasing energy efficiency. Conversely, recycling practices have less of an impact. Furthermore, larger companies, as well as those with greater technological capabilities, are more likely to create these jobs, and they are also open to external sources of knowledge and green products and services. Rutkowska & Sulich (2020) described the synergistic effect of combining green jobs in the Industry 4.0 concept. Green jobs represent in the context of Industry 4.0 the output of environmental policies that encourage enterprises to reduce the negative impact on the environment. According to the authors, the labour market will especially appreciate the scrupulousness, diligence and obligation of future workers. Unay-Gailhard & Bojnec (2019) explored the potential of the green economy in agriculture in creating green jobs. Their model is based on the differences between hired and family labour. They report that there is a significant increase in total labour use on large dairy farms and field crop farms. For field crop farms, this increase can be seen in hired labour, in the case of the dairy farms, the increase can be observed in the area of the family labour. Green job creation is also influenced by specific microeconomic and macroeconomic factors at the SME level, as stated by Cecere & Mazzanti (2017). Green product and service innovations were found to be an important factor in creating green jobs. There may also be observed a relationship between the environmental

management system and green jobs. Sector factors and turnover / demand effects were found to be less significant.

Sulich et al. (2020) examined green jobs in the context of youth employment in the Czech Republic, Poland and Belgium. It can be considered important that in the Czech Republic only 1.83 % of young people find their first job in green jobs. Regarding the two other countries under comparison, Belgium and Poland, this number is around 15 %. According to the authors, these jobs are concentrated mainly in the capital regions, and green jobs are important since they can balance the differences between the economic sectors.

### 3 METHODOLOGY

Based on the inductive research approach, at first, the research problem was defined – the role of graduates with an environmental focus in companies within the green economy. The chosen qualitative approach of the research aims to create new hypotheses, theories or a general understanding of the issue (Disman, 2011; Švaříček, 2005).

The basic theory for the quantitative approach in the case of this paper is the so-called grounded theory. According to Šeďová (2005), it is a relatively popular design for qualitative research in the social sciences. The theory can represent both a methodological approach, but also the output of a qualitative survey. Strauss & Corbinová (1999) state that it is a theory inductively derived from the study of the phenomenon it represents. Furthermore, it is identified, created and provisionally verified by the systematic collection of data that are related to the phenomenon under investigation.

As Švaříček (2005) states, qualitative research through grounded theory begins with the definition of a research question – How do sub-organizational units within an enterprise in the field of green economy perceive graduates with an environmental focus?

As the data collection method, a semi-structured interview was chosen. Key topics were variously modified or incorporated into other topics during the interviews.

1. Enterprise in the context of a green economy
2. Significance of graduates with an environmental focus for the company or organizational unit
3. Labour market situation
4. The role of universities

The subject of the research represented a manufacturing enterprise in the South Bohemian region. Due to the pre-established conditions, the enterprise will be listed under an anonymous label – Enterprise XY. The enterprise belongs to a worldwide group and employs approximately 400 employees in the Czech Republic. With its activities and approach to environmental issues, the enterprise can be included in the so-called green economy.

A total of 6 management-level interviews took place. The job positions of the respondents were: Head of Management System No. 1, Head of Management System No. 2, Personnel Director, Risk Manager, Corporate Ecologist, Logistics Manager. The interviews took place from winter 2021 to spring 2022.

The semi-structured interviews were recorded and subsequently transcribed. The transcripts of the interviews were then coded. The so-called open coding was used. This type of coding consists in creating and assigning terms to parts of the text where the studied phenomena get their names. The terms are further categorized according to their affiliation to the relevant phenomenon (Strauss & Corbinová, 1999). During the management and coding of the data, the



following research topics arose: 1) What makes the Enterprise XY modern? 2) The future of the green economy 3) Relevance of graduates with environmental knowledge for the enterprise 4) Environmental knowledge in the context of economic and technical knowledge 5) The position of graduates with environmental knowledge in the labour market 6) Are universities properly preparing graduates with environmental knowledge?

## 4 RESULTS

The data from the qualitative research were sorted into sub-categories according to the relevant topic. The respondents' statements were translated from the Czech language. Selected statements of the respondents illustrate the identified theories regarding the issue.

### 4.1 What makes the Enterprise XY modern?

At the beginning of the interviews, respondents were left free to indicate how the enterprise they represented was significant or modern. A high degree of agreement could be found in three areas. First, all interviewees began their narrative by talking about what makes an enterprise significant among customers – the end product. This product, according to all respondents, is made to be environmentally friendly and is associated with significant green technologies and practices. According to the respondents, this indicates the starting point from which other characteristics of the enterprise are derived. *"We are an enterprise that has an excellent product right now. That is probably the most important thing that forms the image of the enterprise"* (HR Director, November 2021).

The product determines the enterprises' overall approach to the environment. All respondents also agreed that the enterprise tries to present itself as an environmentally friendly company. They pointed to various international standards or other important certifications. In a few cases, the enterprises' environment, including the office space, was also highlighted as something which is based on the idea of sustainability.

This is further linked to the international status of the enterprise, as it is part of a larger holding. The international presence also implies a wider international customer base. These facts, according to most respondents, create a pressure for products and production to be environmentally friendly. *"In terms of relevance, I would say... or how the enterprise actually operates is that it strives for social responsibility. It is certified according to various international standards and it tries to meet those standards brought by those important customers, especially European and American"* (Head of Management System No. 2, November 2021).

Regarding this topic, the respondents' statements do not differ noticeably. As expected, they are identical. This could be justified by a strong corporate culture and a well-integrated corporate strategy between the sub-organisational units within management.

### 4.2 The future of the green economy

Elements of the green economy are often positioned as a counterpoint to the conventional production scheme. The important question to answer is whether the application of green economy principles pays off for enterprises. The purpose of this research is not to answer this question in general, but to describe the views of managers of the enterprise.

A total of four respondents report that this is already starting to pay off for the enterprise. They claim that it is practically a necessity at this time, especially due to legislative requirements. They also point to the fact that if these green transformation costs are spent now, it will be profitable for the enterprise in the future. In contrast, there are two respondents who are

sceptical with their views. In particular, they point out that it may be currently disadvantageous compared to enterprises that do not apply these elements, or that the effort is being applied more to end measures so far. *"...the customers want it more. All over the world, they want it more. It's a general trend. And there's a lot of pressure on it in terms of legislation as well, on the waste management."* (Head of Management Systems #1, November 2021) *"It's about how the conditions change for that environmental mindset in general, because what I'm seeing so far, at the moment, is the increasing pressure on enterprises in terms of environmental performance in the context of financial sanctions."* (Risk Manager, January 2022).

The application of green economy principles is also linked to the introduction of certifications. All respondents report that customers require these environmental certifications. Half of them specifically highlighted ISO 14000 as the core group of standards, but according to the respondents' statements, the enterprise has applied a number of environmental certifications, which are then mainly linked to audit obligations.

### **4.3 Relevance of graduates with environmental knowledge for the enterprise**

Since the selected Enterprise XY falls within the green economy, according to the theoretical assumptions, the enterprise would be associated with employees who have some environmental focus. In this case, the statements of the respondents are different. The first group states that the enterprise only needs one employee – a corporate ecologist with a narrow focus on environmental issues. This person is in charge of all legislative acts related to environmental regulations. *"We just need that one person, the corporate ecologist, to set things up and then the others have to behave accordingly. But I don't think we need more employees with the same profile and the same knowledge. It's one specialist who does it all"* (Head of Management Systems No. 1, November, 2021).

The second group of respondents stated that environmental awareness is important for more jobs within the enterprise in the future. They confirm that every employee should have some basic environmental knowledge. In addition, they also advocate for technical or economic positions to have this knowledge as well. *"...taking into account our strategy, so for me I think that these graduates who have these technical disciplines and also the knowledge of the environmental issues, for me they have a place here because there is a need"* (Logistics Manager, March 2022). *"I think the managers should have it, and then, of course, it goes across the whole enterprise, I think, i.e. both the employees and the production workers and the people in the warehouses have to have some basic knowledge"* (Management Systems Leader No. 2, November 2021).

### **4.4 Environmental knowledge in the context of economic and technical knowledge**

The majority of respondents associated environmental knowledge mainly with the position of the corporate ecologist. According to their characteristics, the corporate ecologist should have education in environmental issues and thus the greatest environmental knowledge. These are then supported by economic or technical knowledge: *"... a corporate ecologist should be familiar with this issue. He does not need to have so much technical knowledge, but at present he needs mainly legislative knowledge, supported by economic knowledge, to be able to calculate everything"* (Head of Management Systems No. 1, November 2021).

Two respondents further state that the relationship between these three categories of knowledge should ideally be equivalent, although this is not the case in corporate reality. *"Well, some reasonable balance between the three areas"* (Risk Manager, January 2022). *"So that knowledge stands equally alongside the economic and technical ones. It just needs to be more blended"* (Logistics manager, March 2022).

#### **4.5 The position of graduates with environmental knowledge in the labour market**

The labour market often shows a mismatch between supply and demand. A total of five respondents point out that there are enough graduates or employees with environmental knowledge in the labour market. Conversely, there is a shortage of jobs and enterprises that demand these employees. *"My feeling is that there are more of them than the enterprises need. But that's just my feeling"* (HR Director, November 2021). *"My feeling is that there are not enough jobs. When there are some, they require a lot of work experience and it's quite problematic after school, so ... but I think there are enough of those graduates"* (Corporate Ecologist, January 2022).

Two respondents also add that they can be quite costly for companies. *"I think there are enough people, you can always find someone. It depends who you can afford to pay"* (Head of Systems Management #1, November 2021).

#### **4.6 Are universities properly preparing graduates with environmental knowledge?**

There were two main areas of recurrence in the respondents' statements. A total of three respondents considered it important for universities to link education more closely to the corporate environment. This could be achieved through internships or other types of work experience as part of students' studies. *"...it means that it's not just the theory, but those students have that opportunity to look inside those enterprises"* (HR Director, November 2021). *"I know that Enterprise XY is quite progressive in that way, it allows students to have these internships and I've had a few myself and I know that it can have benefits for both parties"* (Head of Management Systems #2, November 2021). *"Maybe some professional practice, so that maybe those schools actually have contracted enterprises where that student could get to know the practice"* (Corporate Ecologist, January 2022).

Half of the respondents also rate graduates with an environmental focus, whether economics or engineering, very positively. According to their statements, they are well equipped theoretically in terms of environmental knowledge and will be an asset to the labour market. *"Those people (graduates with environmental knowledge) have an outlook and can navigate that environment, and I think that's probably the most important thing"* (Risk Manager, January 2022). *"...probably every graduate today knows something about environmental management"* (Logistics Manager, March 2022).

## **5 DISCUSSION AND CONCLUSION**

Using grounded theory, respondents' statements were coded into several topics. Green jobs are particularly important because of the employment of young people who are recent graduates in environmentally-oriented fields (e.g. Sulich et al., 2020). Green jobs are linked to the green economy (Barbier, 2009; UNEP, n.d.; UNEP, 2011). The amount and creation of green jobs in an enterprise is influenced by various factors, which fall either within the concept of circular economy (Moreno-Mondéjar et al., 2021) or are elements of Industry 4.0 (Rutkowska & Sulich, 2020). Furthermore, there is a noticeable influence of various microeconomic or macroeconomic factors (Cecere & Mazzanti, 2017).

Several theories can be drawn from the topics explored in the qualitative research regarding the position of graduates with environmental knowledge in the labour market. The management of the selected enterprise is well aware of its position within the green economy. This is followed by the corporate social responsibility of the enterprise and also by an overall environmentally friendly approach within production. The Enterprise XY holds a number of certifications.

Importantly, in terms of the time horizon, managers are also aware that this is an important characteristic that will determine the company's position in the future.

Graduates with environmental knowledge are important to the enterprise, especially for positions such as the corporate ecologist. However, it is also essential for managers that virtually every employee has basic environmental knowledge. This finding again underlines the importance of such graduates. If we focus solely on environmental knowledge, its relevance will depend on the specific job position. It is often combined with economic or technical knowledge, depending on the specific job.

According to managers, the supply of employees with environmental knowledge and the demand for such employees in the labour market are not in balance. It is pointed out that there are enough graduates with this specialization and, on the contrary, there are few enterprises in the labour market that demand these employees. However, universities prepare their students well regarding this environmental field, although the lack of contact with the corporate environment is often criticised by managers from the selected enterprise.

There is a significant increase in these green jobs within the EU, for example in renewable energy and renewable energy production or waste management (Eurostat, 2021). For further research in this area, it is essential to investigate the role of graduates with environmental knowledge in other economic areas.

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# BENEFITS OF VIRTUAL WORK FROM THE PERSPECTIVE OF A DEVELOPING COUNTRY: CASE OF ALBANIA

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## **Abstract**

Businesses must adopt teleworking as a new working strategy to address the changes in the business environment brought on by technological advancements. The benefits of teleworking for virtual employees in the Western Balkans, with a particular focus on Albania, are not entirely evident, nevertheless. This study contributes to the body of knowledge by examining the advantages of virtual employment for employees. The research methodology is based on descriptive analysis of both qualitative and quantitative methods. A sample of 146 respondents who have worked virtually are included in this study. The overall findings demonstrate that Covid-19 is a well-known factor influencing the phenomena of teleworking. The findings also demonstrated that telework has major advantages, including greater flexibility and independence, a better work-life balance, and others. Additionally, respondents suggest the supervisors to strengthen communication procedures, boost autonomy, and establish better performance management methods and rewarding systems in order to improve the sustainability of these benefits over the long run. Future studies should focus on the drawbacks of virtual work and how they alter company context, particularly managers' perspectives. To check if there are any distinctions between virtual work and virtual workers in terms of age, experience, and industry, it could also be worthwhile to look at other research.

***Keywords:** virtual work, benefits, virtual workers, business development*

## **1 INTRODUCTION**

Nowadays organizations need new information and communication technologies to remain competitive in the market and answer the business environment changes (Nydegger & Nydegger, 2010). Emergent need to embrace the concept of sustainability in turbulent times has changed the nature of how businesses and people work and collaborate (George et al., 2020; Ferreira et al., 2021). Therefore, companies endeavor to find new ways to adapt this reality concerning flexibility (Kelliher & Anderson, 2010), financial sustainability (Yang & Tomek, 2000) and reduction of operational costs (Ansong & Boateng, 2018). Globalization and industries informatisation are well known factors that have shaped operating environment of the business (Wiggins, 2010; Ferreira et al., 2021; George et al., 2020).

Additionally, Covid-19 pandemic is considered as one of the main recent factors that urged businesses to implement new ways of working such as virtual work in order to be sustainable, and provide their products or services (George et al., 2020). Thus, transition from traditional office work to remote/virtual work is crucial to adapt to the new reality and stay ahead to the competitors (Kelliher & Anderson, 2010; George et al., 2020; Ferreira et al., 2021).

Virtual work is a well-known phenomenon in developed countries, however, studies and implementation of remote work in developing countries are still in its infancy. Even though virtual work has taken an increased attention in the eyes of the researchers, yet, in developing countries such studies are missing. Hence, the study seeks potential benefits of adopting virtual/remote work in the business operations of Albania. To pursue our goal, our research questions are: RQ1: What are some of the typical reasons people started working remotely. RQ2: What are benefits of virtual work in developing countries? RQ3: What actions can

employers take to improve remote working? The findings of this research are expected to be useful for decision-makers who may know the main advantages of virtual work to be promoted and implemented at the workplace.

As a result, the paper is divided into the following sections: the introduction, a brief explanation of virtual work and its implication. The second part reviews literature on the adoption and benefits of virtual work and study methodology. Additionally, the analysis is offered in the third part, while the discussion of the results is presented in the fourth section.

## 2 LITERATURE REVIEW

In the bygone era of early industrialization, and subsequently in the previous era of industrial economic systems, many organizational structures were hierarchic and characterized by filtered flows of information and determined sources of authority and leadership (Morrison-Smith & Ruiz, 2020; Bergiel et al., 2008; Pulley et al., 2000). However, in modern economic settings, development is characterized by hyper connectivity, with information being typically hyperlinked and informally funneled (Snellman, 2013). Under such circumstances, business boundaries have expanded further, at times becoming blurred and leading to the rise of a web-like structure in which organizations no longer function as single entities but have rather transformed into configurations of super-compositions, merging the interests and stakes of suppliers, partners, customers, associates, research peers, and employees (Snellman, 2013; Matlay & Westhead, 2005). The advent of information and communication technologies has enabled such super-structures to flourish (Snellman, 2013).

Furthermore, the most recent global pandemic caused by COVID-19 has made interaction increasingly dependent upon communication technologies (Kirchner et al., 2021). Despite the push for an up-tempo return to corporate "normalcy," the pace of transition is proving more lenient among personnel. Employees and managers alike are navigating less secure and more complex working environments, and therefore, virtual work and virtual teams have supplanted tête-à-tête business encounters. The modality has proved resilient, and scholars believe it is here to stay (Kirchner et al., 2021).

Di Martino & Wirth, (1990) defines remote work as "a flexible working arrangement that allows an employee to work from a remote location outside of corporate offices or production facilities, without having personal contact with his/her co-workers but with an ability to communicate with them by means of information and communication technologies". Virtual work is also used as a synonym for "teleworking," "working from home," or "flexible working" (Karácsony, 2021). According to Baruch, (2000), telework is distinguished by two components: a) the requirement to use technology to carry out their daily tasks and activities; and b) the element of distance from the workplace. Currently virtual work is crucial for companies to achieve their competitive edge, improve innovation capabilities (Karia, & Asaari, 2016), and accomplish their recruitment objectives (Kossek & Lautsch, 2018).

Virtual workers identify many benefits and advantages from this new reality: shifting from traditional offices to flexible and virtual workplaces. According to the literature, virtual work improves work flexibility and job autonomy (Harris, 2003; Morgan, 2004; Mello, 2007; Maruyama, & Tietze, 2012; Karácsony, 2021), work-life balance (Morgan, 2004; Karácsony, 2021), travel costs and expenses (Morgan, 2004; Nakroien et al., 2019), and productivity and job satisfaction (Nakroien et al., 2019). The creativity and inspiration of employees, which is a benefit of work autonomy and flexibility, is listed by Pérez et al. (2002) as another advantage of virtual work in terms of organizational and individual level. Employees may be more creative and provide better answers to various challenges under these circumstances, which places a high demand on their critical thinking abilities. Nakroien et al. (2019) conducted a study

concerning the outcomes of virtual work on employees' outcomes. The study used a sample of 128 teleworkers from various fields who are based in Lithuania. Accordingly, the findings demonstrate that working virtually has many benefits, including the ability to work from anywhere and whenever it makes employees feel more productive; better organization of work and family life; the ability to access work documents from wherever the employee is located; and reduced travel costs. Similarly, Tahlyan et al. (2022) state that the COVID-19 outbreak has reshaped the world and, therefore, that telecommuting or teleworking is rapidly spreading across the globe. Despite being forced to work online due to the pandemic, workers increasingly recognize its numerous advantages, including increased productivity and a healthier and better work-life balance.

However, virtual workers also face restraints in their work, which in many cases are intrinsic in nature, due to the disruptive character of technological issues and failures. Studies state that virtual work is characterized by some advantages, including technology use (Ferreira et al., 2021), workload and work-life balance (Kirchner et al., 2021), mental problems and social interaction issues (Yang et al., 2022) etc. Business must adopt a more comprehensive management approach given the potential drawbacks of virtual work arrangements in order to improve the efficiency of their implementation in the post-Covid era. Benefits of virtual work are very important for companies. They might be provided by reduces office costs, increase organization image in terms of sustainable development and talent acquisition (Pérez et al. 2002)

### **3 METHODOLOGY**

To conduct this study is used a descriptive research technique consisting on a quantitative study approach. This is considered as an appropriate research method when we are interested to study "how the things are" for both, qualitative and quantitative research (Leedy & Ormrod, 2005). To conduct this study is used a non-probability sampling strategy. Respondents were chosen using the researchers' contact databases, e-mail addresses and social media. For this study, a semi-structured questionnaire in adapted from previous studies (Horwitz, 2006; Kirchner et al., 2021) and other existing literature. A Likert scale (1- strongly disagree to 5-strongly agree) was employed to determine respondents' perceptions toward benefits of virtual work. While the majority of the research was performed by survey, both structured and open-ended qualitative questions have been asked. It is widely assumed that the combination or integrated use of quantitative and qualitative survey questions enhances explanatory value to primarily data collected (Thomas, 2003).

The questionnaire was sent via social media (Facebook, Instagram, LinkedIn, and WhatsApp) and e-mail, which the researchers knew would be accessible to the target sample. Cost-effective and easier to evaluate are the advantages of this type of investigation. Because the questionnaire was self-administered, interviewer bias was minimized, even though bias in construct validity is still possible. It was critical for this study that participants were engaged in online work while completing the questionnaire. By guaranteeing anonymity, the questionnaire was hoped to encourage genuine and open responses. To examine the reliability, a pilot test including 15 participants was undertaken. From 308 respondents, only 146 were valid that are being analyzed to generate the results of this study. Since this is not a randomized sample, the sample size cannot be calculated mathematically. As a result, researchers seem unable to infer the size of the sample. The statistical analyzed by using SPSS software. To every question, descriptive statistics were generated.



## 4 EMPIRICAL RESULTS

**Quantitative results.** The total valid participants were 147 respondents. The sample consisted of 27% male and 63% female which must have experience with virtual work. The average age was 28-year-old. Additionally, 88% of the sample work in private sector and 12% in public sector. The questionnaire consisted a starting question concerning “the main reason for starting working remotely” (Figure 1). According to the answers, main reasons why people started virtual work were COVID 19 and flexibility offered by remote work.

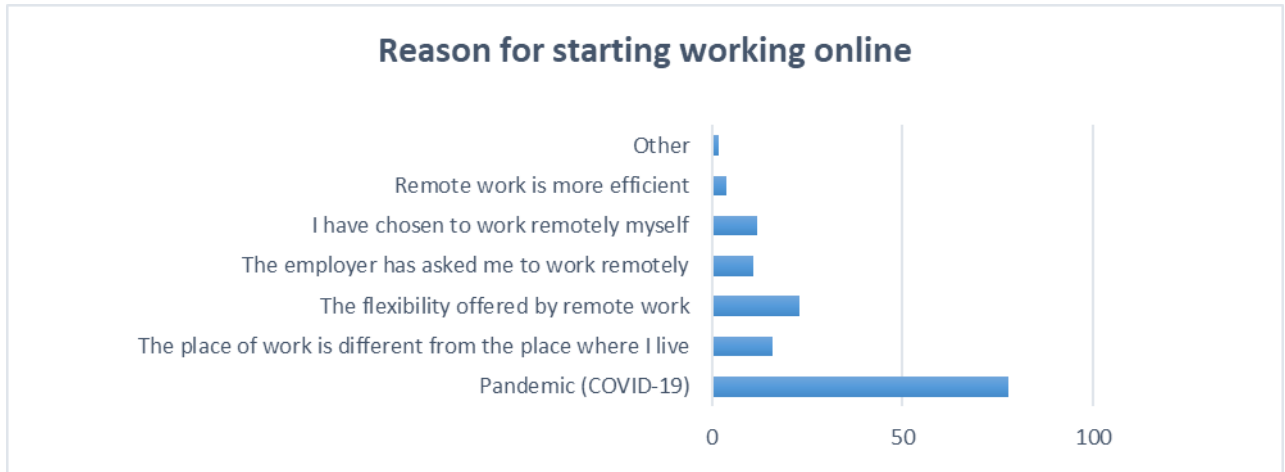


Fig. 1 – The main reason for starting working remotely. Source: own research

We started by developing the reliability test. By measuring Cronbach's Alpha for the included variables, reliability tests were carried out. According to Peterson (1994), a minimum alpha value of 0.5 is appropriate. Data analysis shows that Alpha is 0.93. This suggests that there is a correlation between the questions that were explored and that the range of dependability scores is quite acceptable.

Additionally, the data show that working virtually has various advantages. According to the descriptive data, "I don't need to travel to work" is one of the most significant advantages of virtual labor, with 48 percent of participants strongly agreeing. A significant perceived benefit is the chance to work with multinational corporations. Because they have the possibility to work for worldwide companies, 41% of respondents strongly believe that this is true. Additionally, 37% of respondents strongly concur that the ability to work remotely gives them the freedom to do so. More advantages, such as the opportunity to broaden professional networks at home and abroad, a better family work-life balance, and scheduling flexibility, are also mentioned by respondents.

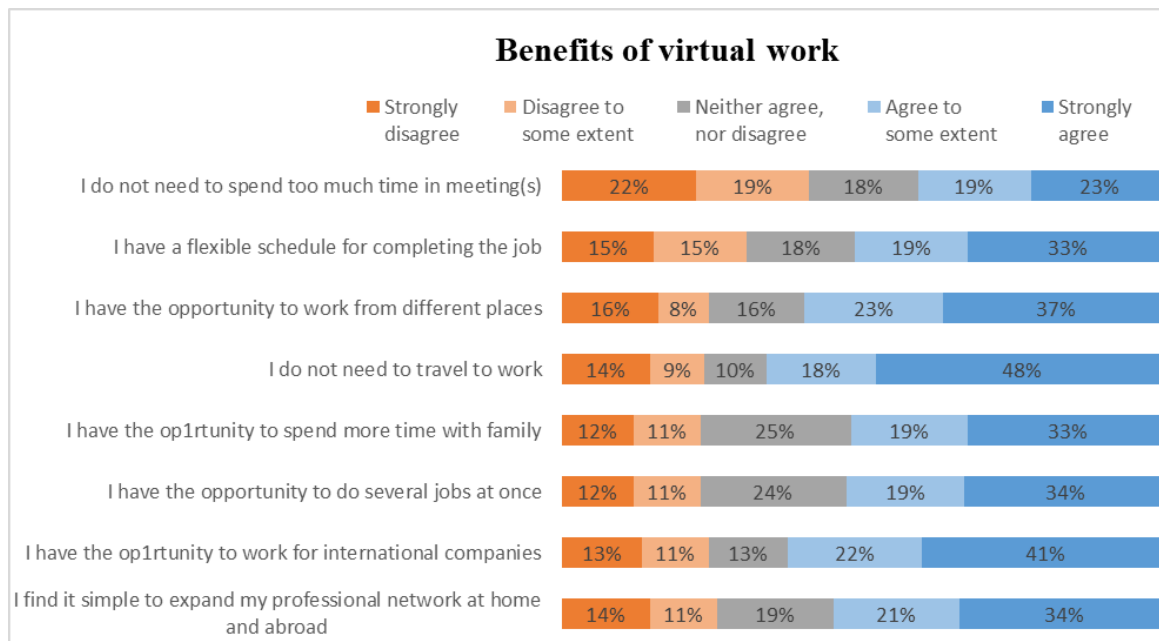


Fig. 2 – Benefits of virtual work. Source: own research

**Qualitative results.** Respondents were questioned about "what action your employer or supervisor can take to improve remote work" in order to better understand the phenomena and analyze how managers and supervisors can manage their organizations to increase the degree of perceived benefits from virtual work. Qualitative results are based on content analysis (Bryman, 2004) focused on virtual works perceptions. Communication and time issues, technology, training, performance and reward management practices are identified as the main issues that should be considered by managers in order to increase the quality of virtual work and employee's satisfaction.

Tab. 1 – What action your employer or supervisor can take to improve remote work. Source: own research

Topic	What steps can the employer take	Example quotes
<b>Communication and time issues</b>	<ul style="list-style-type: none"> <li>• Better communication within the team in order to improve virtual team work organization.</li> <li>• More effective meetings concerning time and task clearness.</li> <li>• Improving delegation, set clear targets and objectives.</li> <li>• Continues communication regarding problems.</li> <li>• Employees needs more flexibility and independence during their work implementation.</li> </ul>	<p>“Better communication and communication to understand our needs”</p> <p>“To be clear the tasks he asks and their meaning”</p> <p>“I need to feel independent during my work and not having pressure on deadlines”</p>
<b>Technology</b>	<ul style="list-style-type: none"> <li>• Provide the right equipment to work in distance.</li> <li>• Use social media communication groups to fasten the communication process.</li> <li>• Improve the internet connection.</li> </ul>	<p>“My company should offer right equipment and internet to facilitate working process”</p>

<b>Trainings</b>	<ul style="list-style-type: none"> <li>• More training on technology usage.</li> <li>• Training to improve virtual work among different team members</li> </ul>	“Supervisors should train us on the new technology”.
<b>Performance management and reward practices</b>	<ul style="list-style-type: none"> <li>• Information about results and feedback concerning task accomplishments</li> <li>• Better rewarding practices concerning performance.</li> <li>• Improve evaluation system, offer bonuses and salary increase.</li> </ul>	“More financial rewards”. “Bonuses when I achieve my objectives”

## 5 DISCUSSION

This study aims to analyze the benefits of virtual work from the perspective of a developing country and implications for supervisors’ work management procedures. The main contribution consists on the benefits of telework perceived by virtual workers. Our results show that virtual workers/teams benefit from virtual work in terms of flexibility. These results are in the same line with the studies conducted by (Pérez, et al, 2002; Harris, 2003; Morgan, 2004; Mello, 2007; Maruyama, & Tietze, 2012; Karácsony, 2021). Also, our results show that virtual work helps employees not to travel to the workplace. Less travel to work is necessary in order for employees to save money on transportation expenditures (Morgan, 2004), as well as for environmental protection because it reduces traffic in cities and air pollution (Nyaanga, 2012; Larson & Zhao, 2017). Because of reduced travel, flexibility in work arrangements may improve traffic conditions, traffic safety, and help reduce levels of environment air pollution (Pyöriä, 2011). Furthermore, our results also indicate that teleworkers spend more time with their families. This procedure aids staff members in avoiding work-family conflicts, which are thought to have a crucial influence in their wellness, motivation, and productivity (Ahsan et al., 2009; Nohe et al., 2015). We found that virtual workers perceive benefits concerning opportunities to work for international companies, and developing and expanding their network at the national and international level. These factors are very important concerning workers’ personal incomes, network growth and personal development. According to Nakroien et al. (2019), positive outcomes of teleworking which include work flexibility, lower travel expenses, trusting relationships with supervisors, the ability to access documents without being in the office, and better relationship management of work and family life, should be taken into account when managing people and making decisions in the future.

Additionally, virtual work has some challenges that might affect the workers such as: lack of expertise to use technological applications, combined with a lack of proper training to become more knowledgeable in making use of virtually facilitated work software. Additionally, knowledge acquisition might also be linked to a higher immediate financial burden for the firm (Morrison-Smith & Ruiz, 2020), as companies must compensate for employee training hours, which are usually translated into reduced working hours. Psychological and emotional factors also have the potential to affect employees, leading to higher levels of disorientation, ambiguity, dissociation from work, etc. Some scholars (Bergiel et al., 2008) have noted that due to the increasingly intangible nature of business relations mediated by virtual teamwork software, some professionals are finding it more difficult to concentrate on tasks, and are more easily detached from deliverables. Therefore, organizations must increase their efforts to make the advantages of virtual work longer-lasting in both time and application. In this aspect, respondents of this study indicated that they needed more training on technology, the proper

tools for the job, better rewarding systems to feel motivated, and improved communication and management relationships.

## **6 CONCLUSION, LIMITATIONS AND FUTURE RECOMMENDATIONS**

This paper highlights the sets of virtual/remote/telework advantages from the perspective of a developing country. The results of this study show that working virtually has various advantages: reduced travel and costs, less time spent in meetings, better family work-life balance, scheduling flexibility, more opportunities to work for different jobs and different companies at the national and international level simultaneously, and network development and growth.

The results demonstrate that workers are benefitting from virtual employment despite Albania's lower level of technological and innovative development. The study's findings are strikingly comparable to those of other research conducted in developed nations. However, in order to make these effects more long-lasting, managers and business owners must focus on a number of factors, including: enabling communication and delegation of tasks and responsibilities, offering training on the use of technological devices, better performance management and the provision of relevant rewards so that employees are motivated, as well as increasing employee autonomy while carrying out tasks. These are crucial findings for organization managers to reevaluate and put forward cutting-edge managerial techniques to collaborate with teleworkers and effectively maintain their motivation. Instead, we emphasize that these are the rules that employers who want to foster an environment for effective work should adhere to.

Apart from the results, this study consists on some limitations: first, if focused only in employer's level. Secondly, there is missing an analysis concerning challenges of virtual work. Thus, future research should address the disadvantages of virtual work and how they affect the context of a business in a developing country. Additionally, it could be interesting to look at other research to see if there are any differences between virtual work and virtual workers in terms of age, experience, and industry. Moreover, a study with a managerial level concentration may yield very significant insights on how to manage this new reality and benefit from it.

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# MARKETING COMMUNICATION OF RAILWAY PASSENGER CARRIERS ON THE SOCIAL NETWORK FACEBOOK IN TIMES OF SARS-COV-2 EPIDEMIC

*Jan Chocholáč, Helena Becková, Lenka Šolcová*

## Abstract

The SARS-CoV-2 epidemic became a challenge for many companies and marketers because it was necessary to revise marketing communication tactics and not lose contact and relationship with customers/consumers even in times of epidemic related restrictions. This paper focuses on marketing communication of railway passenger carriers on the social network Facebook in times of SARS-CoV-2 epidemic. The aim of this paper is to analyse Facebook marketing communication of the Czech Railways, RegioJet, and Leo Express in 2020 and compare the results with the 2019 study. This paper is prepared as a comparative study with the paper of Chocholáč and Becková (2020). The qualitative content analysis and comparative analysis was used for analysing the profiles of selected passenger railway carriers on the social network Facebook. The results of the analysis clearly show that the SARS-CoV-2 epidemic affected railway passenger carriers' marketing communication on Facebook on several levels. The first significant level was the content of individual posts, which were logically significantly influenced by the epidemiological situation. The second level was the number of published posts, with some carriers (RegioJet and Leo Express) publishing significantly fewer posts in 2020 than in 2019. Czech Railways tried to maintain contact with customers/consumers as much as possible even in epidemically difficult times and increased the number of published posts. The paper's main contribution is a comprehensive analysis of marketing communication of selected railway passenger carriers on the social network Facebook and an assessment of the impact of the SARS-CoV-2 epidemic.

**Keywords:** *online marketing, social media marketing, social network marketing, Czech Railways, RegioJet, Leo Express*

## 1 INTRODUCTION

The SARS-CoV-2 epidemic has been and continues to be a challenge for the whole world, countries, economic sectors, and for individual companies. It has had and continues to have direct and indirect impacts especially on companies, particularly economically. As countries had to take many restrictive measures during the SARS-CoV-2 epidemic, individual economic sectors were also affected. The most affected sectors were transport, tourism, accommodation, automotive, retail, and manufacturing. However, the extent of the impact of the SARS-CoV-2 epidemic on individual sectors varies from country to country. Due to the implementation of restrictive measures by countries, direct contact with customers and consumers has been significantly reduced in many sectors, in some cases to zero. It was at this time that the importance of marketing communication, especially in its online form, was further strengthened. Online marketing communication makes it possible to be in contact with customers and consumers through the online environment. This can partially replace direct contact, which was not possible during the epidemic due to restrictive measures. This paper focuses on how the three most important companies in the Czech passenger railway transport market faced this challenge. This paper is standardly divided into six sections: Section 2 – Theoretical background, Section 3 – Methodology, Section 4 – Results, Section 5 – Discussion, and Section 6 – Conclusion.



## 2 THEORETICAL BACKGROUND

The rapid development of social networks has enabled people to easily establish friendships without the constraints of geographic borders or time zones (Zhou, 2011). Currently, people have more communication channels through which to link up (e.g. Facebook, Instagram, Twitter) (Shen et al., 2016). Nowadays, the use of marketing communication tools is essential from the perspective of every marketer (Šerić, 2017). People are spending more and more time using social media, and it implies the fact that their importance for advertising purposes is growing (Breuer and Brettel, 2012). The image of a successful company is currently created under the strong influence of social media, especially social networks (Hristache, Paicu and Ismail, 2014). Companies today have a significant advantage because they can use digital media or social media like Facebook, Instagram, YouTube in promoting their business (Febriyantoro, 2020). Social networks marketing is defined as a process of gaining customers' attention and acceptance through social networks such as Facebook, Instagram, Twitter, TikTok, etc. (Li, Lai and Lin, 2017). Social networks have changed the media landscape and marketing communication, as new communication channels have complemented and sometimes even replaced traditional ones (Pan, Torres and Zúñga, 2019). Traditional media like television and newspapers have lost viewers or readers (Duffett, Edu and Negricea, 2019).

### 2.1 The importance of social networks for companies

Social networks offer companies the opportunity to communicate more effectively to target consumer groups in social network communities than in other types of media (Shen et al., 2016), and represent for companies a relevant marketing tool that affects marketing strategies and practices (Valos, Maplestone and Polonsky, 2017; Klepek and Starzyczná, 2018; Pantano, Priporas and Migliano, 2019). Grewal et al. (2016) stated that social media, such as Facebook, Twitter and YouTube, today attract hundreds of millions of users. At the same time, social networks allow companies to acquire informal source for understanding customers' preferences, competitors' activities, market trends and product feedbacks (Rojas, Garrido-Moreno and García-Morales, 2020). Within social networks, companies can listen to consumers directly and to develop a deep consumer knowledge (Arrigo, Liberati and Mariani, 2021). There are many scientific studies that confirm the positive impact of social networks on brand awareness, customer engagement, and customer loyalty (Leung et al., 2013; Almeida-Santana & Moreno-Gil, 2017). Customers interact with companies through digital channels encouraging the company to realize the need to record interactions with customers and measure performance to serve as a reference for designing effective marketing strategies (Febriyantoro and Arisandi, 2018). Raji, Mohd Rashid and Mohd Ishak (2018) verified that positive brand equity is a fundamental indicator that shows the effectiveness of each used marketing communication tool. Customers interact with brands through social networks for several reasons, such as product information, access to customer service and content, entertainment, brand engagement, and promotions (Shawky et al., 2020). Voorveld (2019) reviewed the main challenges facing brand communication in social media and assumed that future content would be more organic, more social, and less commercial. Shen et al. (2016) recommended the use of interactive content. Liu et al. (2015) highlighted the need to engage influencers for support electronic word-of-mouth marketing activities and Abri and Valaee (2020) considered it important to engage influencers to support viral marketing activities. On the other side, Shen et al. (2016) point out the risk of social networks where customers may start to ignore the content because of the more advertising.

Facebook's rapid growth is due the Facebook role in helping people connect online in this vast virtual social network (Shu and Chuang, 2011). Facebook provides a way to increase

the effectiveness of Internet advertising (Shen et al., 2016). Facebook contains some tools and features such as likes, comments, and posts to simplify the users' identification of relevant information (Koroleva and Kane, 2017). On the other side, the Facebook's system to register likes, comments, and shares measures brand-consumer interactions (Gerlitz and Helmond, 2013; Hinson et al., 2019). The number of likes is practically considered as a measure of customer response (Kim, Spiller and Hettche, 2015; Ding et al., 2017).

## **2.2 Marketing communication in the context of the SARS-CoV-2 epidemic**

The SARS-CoV-2 pandemic has a substantial impact on global economic, political, and sociocultural systems, and particularly, on travelling and transport (Sigala, 2020). Travelling and tourism were among the most affected sectors of national economies worldwide due to the SARS-CoV-2 pandemic (Darázs and Šalgovičová, 2021). Because of the SARS-CoV-2, countries have imposed travel restrictions that have impacted all transport modes and related value chains (Gössling, Scott and Hall, 2021). The effects of the SARS-CoV-2 pandemic on travelling, tourism, and transport are due to three specific reasons: official travel restrictions, event cancellations, and travellers' fear of the risk (Wang and Su, 2020). This situation described Gössling, Scott and Hall (2021) as moving from over-tourism to non-tourism transferred to the transport sector as moving from over-transport to limited transport. The travel demand has significantly decreased and has created a great deal of uncertainty about future passenger transport behaviour (Li, Nguyen and Coca-Stefaniak, 2020). In the context of this situation, an additional and more pressing challenge for companies has emerged, as companies needed to maintain communication with their clients (González, Camarero and Cabezudo, 2021). Social networks and online communities have enabled companies to stay in touch with their customers even during the SARS-CoV-2 pandemic crisis (González, Camarero and Cabezudo, 2021). They also illustrated on the example of online travel agencies that during the state of SARS-CoV-2 epidemic emergency, marketing communications have proven essential to maintain emotional ties with online communities even though sales have plummeted to zero.

## **2.3 Social media marketing communication in railway transport sector**

Very few authors have addressed the issue of social media marketing communication in railway transport sector and there are also very few scientific studies. Narayanaswami (2018) examined the situation in the Indian Railways environment. Yang and Anwar (2016) evaluated railway services in New South Wales in Australia and dealt with the issue of digital social media and their use in the practice of railway companies. Gabore and Xiujun (2018) focused on the impact of online news on the views of social media users and give an example of the construction of the first modern international line in Africa, namely Ethiopia-Djibouti.

In the environment of the Czech Republic, this issue was addressed by Chocholáč and Becková (2020). They analysed Facebook marketing communication of the selected railway passenger transport companies (České dráhy, a.s. – further in the text Czech Railways or abbreviated “CR”, RegioJet a.s. – further in the text RegioJet or abbreviated “RJ” and Leo Express s.r.o. – further in the text Leo Express or abbreviated “LE”) in 2019. The main findings of the study of Chocholáč and Becková (2020) were as follows: RegioJet chooses the path of an intensive communication strategy, Czech Railways has chosen a conservative strategy, and Leo Express a defensive strategy. Further differences were identified in terms of post content, frequency of posting and audience interaction. Finally, it should be noted that the period analysed (year 2019) was not affected by the impact of the SARS-CoV-2 epidemic. This fact opens a great research gap for the processing of this comparative study which will

focus on comparing railway passenger carriers marketing communication on the social network Facebook in 2019 and 2020, when the SARS-CoV-2 epidemic is already fully underway. The aim of this paper is to analyse Facebook marketing communication of the Czech Railways, RegioJet, and Leo Express in 2020 and compare the results with the 2019 study.

### 3 METHODOLOGY

This paper is conceived methodologically like to the study of Chocholáč and Becková (2020) to be able to compare the results of both papers with each other and then discuss them. Based on the literature review conducted in social media marketing communication, marketing communication in the context of SARS-CoV-2 epidemic, and social media marketing communication in the railway transport sector, the research question was set.

*Research question:* How has the SARS-CoV-2 epidemic affected railway passenger carriers' marketing communication on Facebook? Subsequently, related hypotheses were established. *Hypothesis 1:* The SARS-CoV-2 epidemic affected the content of Facebook posts in 2020 compared to 2019. *Hypothesis 2:* The number of posts published by individual carriers on Facebook decreased in 2020 compared to 2019. *Hypothesis 3:* The number of fans posted by individual carriers on Facebook decreased in 2020 compared to 2019. *Hypothesis 4:* The number of likes to posts by individual carriers on Facebook decreased in 2020 compared to 2019. The processing methodology is presented in Fig. 1.

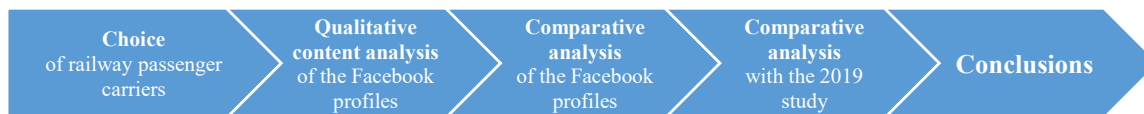


Fig. 1 – The processing methodology. Source: authors

In the first step, relevant railway passenger carriers operating on the Czech market were selected. These companies control the largest part of the market and carry the most passengers. These are Czech Railways, RegioJet, and Leo Express. In the second step, a qualitative content analysis of the Facebook profiles (České dráhy, 2022; Leo Express, 2022; RegioJet CZ, 2022) of these three carriers for the year 2020 was processed by three independent researchers. According to the study of Chocholáč and Becková (2020), the researchers' attention was focused on the total number of posts; the number of followers; the frequency of posts (by days); the total number of likes; the total number of comments and shares; the average number of likes, comments, and shares; the content of the posts. In a third step, a comparative analysis of the results between the three carriers analysed for 2020 was carried out. In a fourth step, the results were compared with an identical study by Chocholáč and Becková (2020) in 2019. Finally, the conclusions were defined in the context of the hypotheses and the stated research question.

The following standard scientific methods were used in the preparation of this paper: qualitative content analysis (second step) and comparative analysis (third and fourth step). The method of qualitative content analysis is a research technique for making replicable and valid inferences from texts or other meaningful matter to the context of their use (Krippendorff, 2003). Kibiswa (2019) defined qualitative content analysis as a research method carried on in either an inductive or a deductive way. Inductive approach or indirect approach is based on the principle that researchers draw themes from data they collected to start their research; in deductive approach, also known as direct approach, they rather draw

them from existing theory / theories to set up the themes that guide their research (Kibiswa, 2019). The method of qualitative comparative analysis is a non-statistical research data analysis technique for determining which logical conclusions a data set supports (Ragin, 1987). This method begins with listing all the combinations of variables observed in the data set, followed by applying the rules of logical inference to determine which descriptive inferences or implications the data supports (Ragin, 1987).

## 4 RESULTS

Table 1 presents the basic overview of data from Facebook profiles of analysed railway passenger carriers. This data was obtained using the scientific method of qualitative content analysis. Subsequently, the 2020 data from each railway carrier was compared to each other and compared to the 2019 study data using a comparative analysis method.

Tab. 1 – The basic overview of data from Facebook profiles of analysed railway passenger carriers.  
Source: České dráhy (2022), Leo Express (2022), RegioJet CZ (2022), Chocholáč and Becková (2020), authors

<b>Facebook social network</b>	<b>CR 2019</b>	<b>CR 2020</b>	<b>RJ 2019</b>	<b>RJ 2020</b>	<b>LE 2019</b>	<b>LE 2020</b>
Number of people who like this	73 461	100 165	86 232	93 165	81 040	81 242
Number of people who follow this	75 289	103 201	85 558	93 768	81 266	81 559
Total number of posts	204	264	256	189	150	138
Total number of likes	51 997	182 556	35 659	44 510	11 696	11 758
Total number of comments	11 993	16 817	16 263	14 024	4 615	4 472
Total number of shares	10 056	30 175	1 714	14 005	1 285	759

The following key conclusions emerging from Table 1 can be divided into six sections: number of people who like this, number of people who follow this, total number of posts, total number of likes, total number of comments, and total number of shares.

In terms of the number of people who like the profiles of railway carriers, it is evident that Czech Railways had the most fans in 2019 and 2020 (73 461 in 2019 and 100 165 in 2020), followed by RegioJet (86 232 in 2019 and 93 165 in 2020) and Leo Express (81 040 in 2019 and 81 242 in 2020). However, it is interesting that Czech Railways managed to increase the number of users by 36.35% year-on-year even in the epidemic period, while RegioJet only by 8.04% and Leo Express only by 0.25%. This fact may be due to the significantly higher market coverage of Czech Railways compared to other carriers and to the fact that users needed to obtain up-to-date information on railway passenger transport in times of state restrictions. The situation is similar for another monitored parameter – the number of people who follow this. Again, it is evident that Czech Railways had the most followers in 2019 and 2020 (75 289 in 2019 and 103 201 in 2020), followed by RegioJet (85 558 in 2019 and 93 768 in 2020) and Leo Express (81 266 in 2019 and 81 559 in 2020). However, it is again interesting that Czech Railways managed to increase the number of users by 37.07% year-on-year even in the epidemic period, while RegioJet only by 9.60% and Leo Express only by 0.36%. Based on these two monitored parameters, it can be clearly stated that Czech Railways managed to attract significantly more new Facebook users than the other analysed railway carriers even in the epidemic period. Czech Railways gained 26 704 new fans and 27 912 new followers year-on-year in absolute numbers, while RegioJet gained only 6 933 new fans and 8 210 new followers and Leo Express only 202 new fans and 293 new followers. From this Czech Railways managed communication on the social network Facebook in the

epidemic period significantly better than the other analysed carriers and managed to keep in touch with their customers/consumers.

The results of the total number of posts parameter are presented in Fig. 2. The results show that Leo Express reduced the number of posts year-on-year from 150 to 138 (year-on-year decrease by 8.00%), RegioJet also reduced the number of posts year-on-year from 256 to 189 (year-on-year decrease by 26.17%). Only Czech Railways increased the number of posts year-on-year from 204 to 264 (year-on-year increase by 29.41%). Other metrics can be directly or indirectly linked to this parameter, such as number of likes, number of fans, number of followers, number of shares and number of comments.

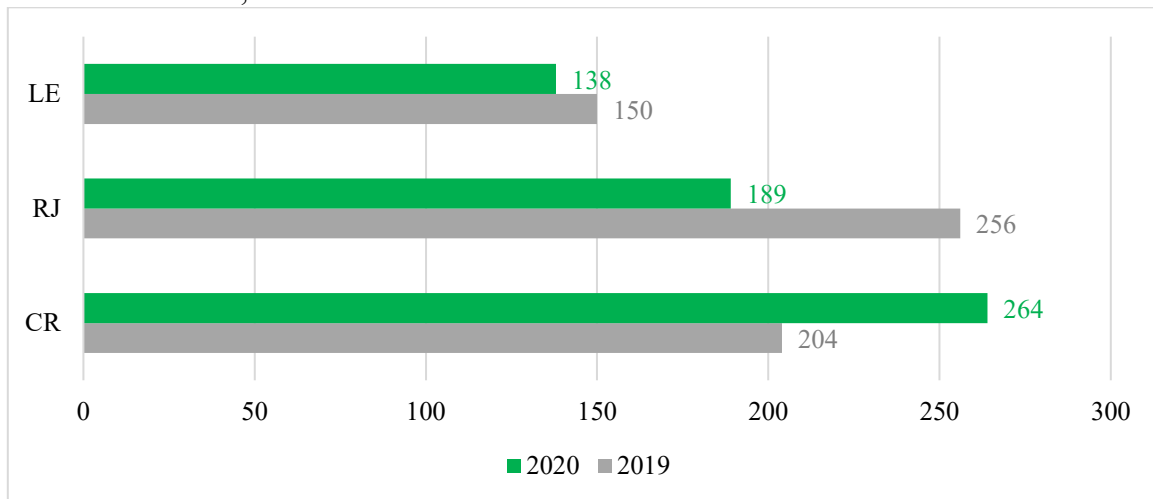


Fig. 2 – The total number of posts on Facebook in 2019 and 2020.

Source: České dráhy (2022), Leo Express (2022), RegioJet CZ (2022), Chocholáč and Becková (2020), authors

Figure 3 shows a comparison of the average number of Facebook posts per day per railway carrier in 2019 and 2020. The data shows that the average number of new posts at Leo Express is very similar (0.411 in 2019 and 0.378 in 2020).

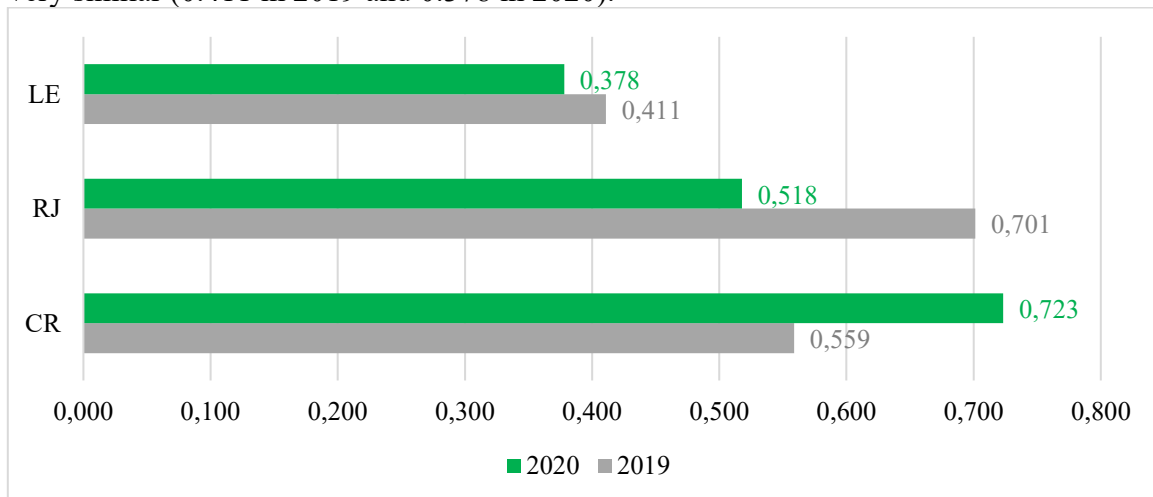


Fig. 3 – The average number of posts per day on Facebook in 2019 and 2020.

Source: České dráhy (2022), Leo Express (2022), RegioJet CZ (2022), Chocholáč and Becková (2020), authors

In contrast, RegioJet has seen a significant decrease in the average number of posts per day. In 2019, RegioJet published 0.701 posts per day, but in 2020 it was only 0.518 posts per day. In contrast, Czech Railways increased the value of the indicator year-on-year from 0.559 in 2019 to 0.723 in 2020.

In terms of the total number of likes, Czech Railways was significantly successful year-on-year. The company gained 251.09% more likes in 2020 than in 2019, namely 51 997 likes in 2019 and 182 556 in 2020 (an absolute year-on-year increase of 130 559 likes). RegioJet and Leo Express also recorded a relative year-on-year increase in the number of likes, but very low compared to Czech Railways. RegioJet gained 8,851 more likes in absolute terms (a relative year-on-year increase of 24.82%) and Leo Express gained only 62 more likes in absolute terms (a relative year-on-year increase of 0.53%).

In terms of the total number of comments, Czech Railways again recorded a significant year-on-year increase, with a relative increase of 40.22% and an absolute increase of 4,824 comments. The other carriers analysed saw a sharp decline in the number of comments on posts. The number of comments on RegioJet posts decreased by 13.77% year-on-year in relative terms and by 2,239 comments in absolute terms, while the number of comments on Leo Express posts also decreased by 143 comments in absolute terms and by 3.10% in relative terms. This indicator reflects the fact that RegioJet and Leo Express have not been able to generate user interaction as well as Czech Railways.

In terms of the total number of shares, RegioJet and Czech Railways recorded a significant year-on-year increase. RegioJet's post sharing has skyrocketed year-on-year by 717.09% in relative terms and 12,291 in absolute terms. Czech Railways posts were shared by more than 20,119 users in absolute terms year-on-year (a relative year-on-year increase of 200.07%). This is very likely due to the need of Facebook users to share information of railway carriers (especially information related to the epidemiological situation) among their contacts within the social network. Paradoxically, however, it is interesting to note that Leo Express has seen a rapid decline in post sharing from 1,285 in 2019 to 759 in 2020 (an absolute decline of 526 shares and a relative decline of 40.93%). On the other hand, it must be added that this parameter is closely linked to the parameter of the number of posts and their content.

Fig. 4 shows the posts with the highest number of likes in 2020 for all three carriers analysed.



Fig. 4 – The posts with the largest number of likes on Facebook in 2020.  
Source: České dráhy (2022), RegioJet CZ (2022), Leo Express (2022)

The most liked post with video at Czech Railways was that of retiring employee Libor Vobořil, who had worked for the company as a driver for more than 50 years. This post received about 24 000 likes, 693 comments and over 1 600 shares.

RegioJet scored a major success with a very funny video post in relation to the current epidemiological restrictive measures, which tried to make light of the situation as much as possible and thank all passengers for their consideration and acceptance of the epidemiological measures. This post received about 5 000 likes, 291 comments and over 11 000 shares. Leo Express' most successful post focused on thanking a passenger who, as a doctor, saved another passenger on board the train who had suffered a cardiac collapse. This post received about 603 likes, 49 comments and 50 shares.

Fig. 5 shows the results of the content analysis of Facebook posts in 2020 by individual railway carriers. The results of the analysis clearly show that destination promotion (156 posts in total) and information related to the SARS-CoV-2 epidemic (140 posts in total) were the dominant themes. These other topics have been the subject of around 50 posts in total: competitions – 54 posts, photos taken by fans and employees – 52 posts, vehicle fleet – 48 posts. Czech Railways published in 2020 the most posts related to the SARS-CoV-2 epidemic (90 posts), followed by destination promotions (54 posts) and vehicle fleet information (44 posts). RegioJet mostly highlighted destination promotion (79 posts), photos taken by fans and employees (32 posts) and competitions (28 posts). Leo Express focused most on the SARS-CoV-2 epidemic in 2020 (32 posts), destination promotion (23 posts), and the loyalty programme and photos taken by fans and employees (20 posts).

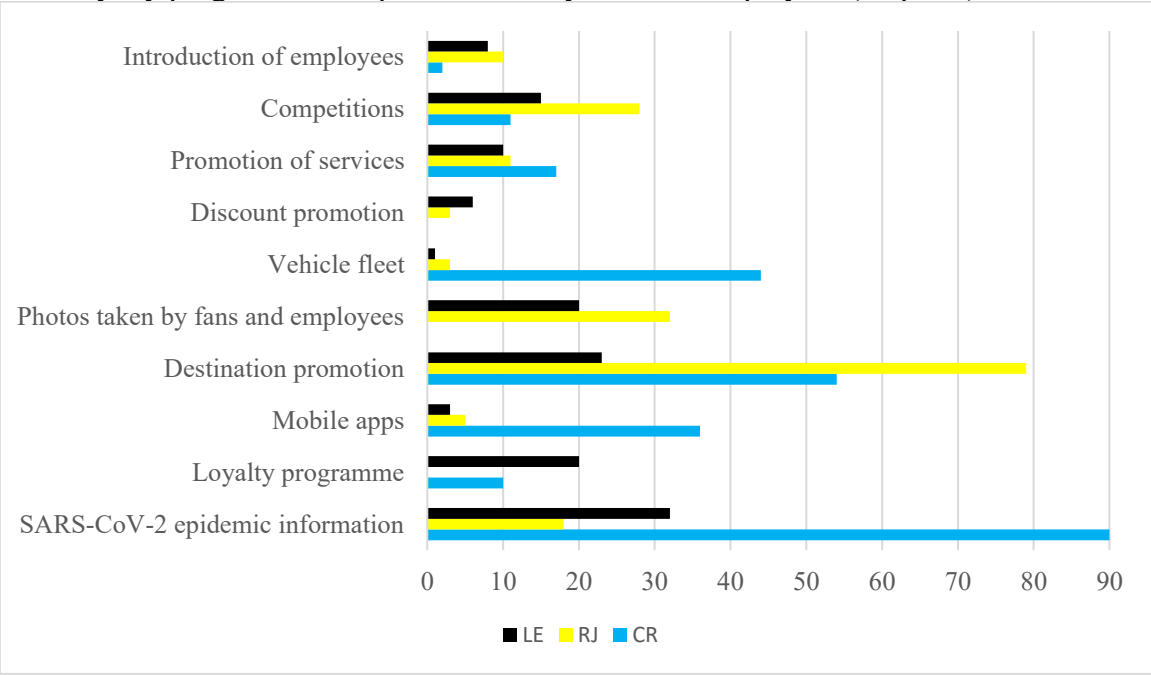


Fig. 5 – The content of the posts on Facebook in 2020.  
 Source: České dráhy (2022), Leo Express (2022), RegioJet CZ (2022), authors.

In the case of comparing the results from Fig. 5 with the results from 2019 according to Chocholáč and Becková (2020), it is evident that the issue of the SARS-CoV-2 epidemic has come to the forefront of the content of the posts, which is understandable in the context of events. The topic of destination promotion has also been strengthened with more posts to promote train travel at a time when the epidemiological situation was not critical and restrictive measures allowed for standard train travel (especially summer 2020). For very understandable reasons, event promotion, recruitment marketing activities, and partnership promotion were significantly reduced as the epidemic period was highly unpredictable.

## 5 DISCUSSION

The following *research question* was stated in the introduction of the paper: How has the SARS-CoV-2 epidemic affected railway passenger carriers' marketing communication on Facebook? Based on the results of the analysis, it can be concluded that the SARS-CoV-2 epidemic affected railway passenger carriers' marketing communication on Facebook on several levels. The first significant level was the content of individual posts, which were logically significantly influenced by the epidemiological situation and 23.69% of posts were thematically devoted to the SARS-CoV-2 epidemic. The second level was the number of published posts, with some carriers (RegioJet and Leo Express) publishing significantly fewer posts in 2020 than in 2019. Czech Railways, on the other hand, tried to maintain contact with customers/consumers as much as possible even in epidemically difficult times and increased the number of published posts by 29.41%. This fact is consistent with the opinion of González, Camarero and Cabezudo (2021), who suppose that social networks enabled companies to stay in touch with their customers even during the pandemic crisis. It is also in line with the statement of Pan, Torres and Zúñga (2019) that new communication channels have complemented and even replaced those traditional ones. The post count parameter is also related to other parameters such as the number of likes, shares, comments, new fans, and followers. Furthermore, the individual hypotheses will be confirmed or rejected.

*Hypothesis 1:* The SARS-CoV-2 epidemic affected the content of Facebook posts in 2020 compared to 2019. Hypothesis 1 was confirmed because the content of the Facebook posts of the analysed railway carriers was significantly affected by the SARS-CoV-2 epidemic. There was not a single post dedicated to the SARS-CoV-2 epidemic in 2019 because the epidemic was not a media issue for the Czech Republic. By contrast, in 2020, 29.41% of posts (140 posts in absolute terms) were already dedicated to the SARS-CoV-2 epidemic, of which Czech Railways 90 posts, Leo Express 32 posts and RegioJet 18 posts.

*Hypothesis 2:* The number of posts published by individual carriers on Facebook decreased in 2020 compared to 2019. Hypothesis 2 was confirmed only for Leo Express and RegioJet and rejected for Czech Railways. The results show that Leo Express reduced the number of posts year-on-year from 150 to 138 and RegioJet also reduced the number of posts year-on-year from 256 to 189. Only Czech Railways increased the number of posts year-on-year from 204 to 264. In epidemiologically non-standard times when many restrictive measures are in force, it is necessary to either maintain the number of posts as in the standard period or to increase the number of posts to avoid weakening or complete loss of connection with the customer/consumer.

*Hypothesis 3:* The number of fans posted by individual carriers on Facebook decreased in 2020 compared to 2019. Hypothesis 3 was rejected. All three railway carriers analysed have seen an increase in the number of Facebook fans between 2019 and 2020, specifically Czech Railways managed to increase the number of fans by 36.35% year-on-year even in the SARS-CoV-2 epidemic period, while RegioJet only by 8.04% and Leo Express only by 0.25%.

*Hypothesis 4:* The number of likes to posts by individual carriers on Facebook decreased in 2020 compared to 2019. Hypothesis 4 was rejected. Czech Railways was significantly successful year-on-year. The company gained 251.09% more likes in 2020 than in 2019, namely 51 997 likes in 2019 and 182 556 in 2020 (an absolute year-on-year increase of 130 559 likes). RegioJet and Leo Express also recorded a relative year-on-year increase in the number of likes. RegioJet gained 8,851 more likes in absolute terms (a relative year-on-year increase of 24.82%) and Leo Express gained only 62 more likes in absolute terms (a relative year-on-year increase of 0.53%). In accordance with the studies mentioned above



(Kim, Spiller and Hettche, 2015; Ding et al., 2017), it is possible to state that customer response increased, especially in the case of Czech Railways. Moreover, the posts with the highest number of likes were videos, which corresponds with studies talking about the need for more organic, social, and interactive content (Voorveld, 2019; Shen et al., 2016).

This paper and research contain the following limitations that need to be mentioned and discussed. The first limit is the choice of the social network Facebook. However, there are more communication channels people can use nowadays as Shen et al. (2016) point out. Railway undertakings are also active on other social networks (Instagram, Twitter, YouTube, etc.). Therefore, this paper does not aim to compare comprehensively the marketing communication of the analysed carriers on social networks but focuses only on Facebook. Moreover, the paper follows the study of Chocholáč and Becková (2020) where Facebook was also analysed. Another limitation is the choice of railway passenger carriers, as there are other carriers on the Czech market. The selection of railway carriers was chosen again according to the study of Chocholáč and Becková (2020) for the sake of results comparability. At the same time, the three most important carriers on the Czech market in terms of market share and number of passengers carried were selected.

## 6 CONCLUSION

The aim of this paper was to analyse Facebook marketing communication of the Czech Railways, RegioJet, and Leo Express in 2020 and compare the results with the 2019 study. The paper's main contribution was a comprehensive analysis of marketing communication of selected railway passenger carriers on the social network Facebook and an assessment of the impact of the SARS-CoV-2 epidemic. The results of the analysis clearly show that the SARS-CoV-2 epidemic was a challenge in terms of marketing communication on Facebook also for the analysed railway carriers. In 2020 the SARS-CoV-2 epidemic has significantly affected the number and content of posts and other related indicators. Czech Railways published more posts year-on-year and did their best to inform and maintain contact and relationships with customers/consumers in times of SARS-CoV-2 epidemic. This tactic may have resulted in a sharp increase in fans, followers, and other types of interactions with posts. On the other hand, RegioJet and Leo Express reduced the number of posts year-on-year.

Further follow-up research in this area may focus on the analysis of other social networks such as Instagram, YouTube, Twitter, TikTok, etc. and their use in the passenger railway segment. Further, other domestic railway operators may be included in the research or comparisons may be made with foreign countries. A major challenge is to compare marketing communication with other transport segments, such as air or bus transport.

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# **BENEFITS OF BANCAINSURANCE IN THE PRESENT TIME**

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## **Abstract**

The aim of this article was to find out the impact and benefits of bancassurance in the current era. To see what this branch of banking has to offer and in which direction it is heading. The direction of bancassurance is part of the services offered by banks in cooperation with insurance companies. We were also interested in the specific insurance offered by the three largest banks on the current financial market in Slovakia, which we tried to compare. In order to go deeper into the issue, we developed an online questionnaire, which was filled out by 150 respondents. And based on their answers, we learned certain facts about the behaviour of Slovak clients, which also affect the market of insurance products offered by banks. This article will try to create a kind of overview of these services and how people today react to these services.

*Keywords: Payment Cards, Insurance, Digitalization, Fintech*

## **1 INTRODUCTION**

Digitization is very closely connected with the banking sector. Banks and other financial institutions can't even imagine what digitization provides them without services. Services such as internet banking, which include many other services, provide financial institutions, but also clients with the assurance that payments will be sent in the right direction. Even logging into the application that these services offer must meet many more requirements in today's world than it was in the past. Everything relates to modern technology, which is so important to the operation of these aforementioned services. In order for all of this to work, there is also a client on the other side who must be able to control and dispose of various technologies such as smartphones, computers and other technologies that are already offered today, the so-called digitization. And it is not only about using these facilities, but also about the very understanding of the given service and product offered by banks and insurance companies. This is also what this article should be about, to find out how people understand and trust the various insurance products offered to them by banks and insurance companies.

## **2 DIGITALIZATION**

Gartner (2021) defines the term digitization as the use of new technologies to provide new opportunities for companies and the entire business sector. To denote new technologies, the term FinTech is used as an abbreviation for financial technologies (FinTech, 2016).

The banking sector has also undergone huge changes in recent years. He had to adapt to several pitfalls caused by external factors that cannot be easily influenced. In 2019, we were hit by the COVID 19 pandemic, and each sector as well as people had to deal with it in their own way. The banking sector proved to be very flexible because it was able to adapt very quickly to given situations. The concept of open banking, which began to develop even before the mentioned pandemic, also helped. The entire banking system has become more open with the help of digitization techniques and thus began to function better.

In the past, clients had to go directly to the branches of financial institutions to arrange something. Nowadays, it can all be done online, you just need to have the right equipment, knowledge, and skills. Even before the pandemic, various software and applications began to be developed that allowed clients to be closer to their banking and insurance products and

services. From our point of view, the pandemic only accelerated this process and later improved it even after covid time. In today's world, it is no longer a problem to insure yourself for a business trip or vacation online, everything can be done through specific applications of the given financial institution. These types of applications are called PFM applications (Personal Financial Management Applications). Thanks to these applications, it is possible for the client to display an immediate and up-to-date visual overview of the purchased banking or insurance product or service (Sedliaková, 2018).

All these processes and changes already started at the end of the 20th century. The development of the Internet itself, without which we cannot even imagine, certainly has a great influence on it. CHIP and PIN technologies, which supported the creation of much-needed payment cards and thanks to which e-commerce was supported, are also very necessary. The next step was the creation of intelligent devices that could connect clients, people, and financial institutions without personal interaction, and a tokenization verification system would be enough for that.

The Chairman of the Board of Directors of AFISP (Association of Financial Intermediaries), Martin Lancz, commented on the impact of digitization as follows: *"Digitalization brings benefits for clients, financial institutions, as well as financial intermediaries and advisors. For example, saving time and costs, speeding up the contract acceptance process for life insurance, including medical underwriting, speeding up the flow of premium payments, insurance payments or commissions, or a significant reduction in the environmental burden."* According to Martin Lancz, the companies represented by the association have invested significantly in the digitization of new technologies to improve the quality of their work, and therefore better services for clients. He claims that: *"Mobile applications with useful services are now commonplace. Clients have all contracts and contact information stored in the applications, they can report insurance claims, compare financial products and the like through the application"* (Financial report, 2021).

### **3 BANKS AND BANK INSURANCE**

The current financial market offers clients a choice of financial services from 11 different banking institutions based in Slovakia, as well as over 400 foreign banks and other credit institutions operating in Slovakia. From the website of the National Bank of Slovakia (NBS, 2022), we learned about the scope of 10 insurance companies based in Slovakia and 590 insurance companies based outside Slovakia.

The active operations of commercial banks also include the sale of insurance products and services, which is why this sector is also called bancassurance. However, this term is not so precisely defined. It was created as a combination of insurance services offered by banks. Korauš (2005) defined the term bancassurance as follows: *"is a term denoting the sale of insurance through established bank distribution channels. The result is a bank offering banking, insurance, credit and investment products to its clients."* Elda Marzai (2018) described bancassurance as a mutual agreement between a bank and an insurance company. Both institutions are equal and work together as partners in business. Banks will gain additional income by selling insurance products, while insurance companies will expand their customer bases without being forced to create new sales points or pay commissions to other intermediaries.

This cooperation between the banking and insurance sectors had its beginnings in Great Britain as early as 1908. The first such cooperation was called Saving Bank Life Insurance. In 1929, however, a wave of stagnation came, the reason being the economic crisis, when more than 1,000 banks went bankrupt. In the 60s of the 20th century, bancassurance began to prosper again, namely in France, where the so-called banking and insurance association. In the 1990s,

bancassurance became closer to people by creating a new product combined in personal property insurance.

Distribution channels are important for their cooperation. Korauš (2005) explains this by saying that each financial institution chooses the best possible distribution channel, and this choice depends on the strategy of each institution involved in the contract, and all of this has an impact on pricing and product development, which is offered to the client in the final phase.

The Corporate finance institute also describes the digital transition in the field of bancassurance as follows: *"Digitalization is significantly affecting the bancassurance business model and banks are slowly moving their bancassurance online. The Internet is closing the gap between product developers and customers. In this sense, banks may lose their network benefits in the bancassurance contract. In addition, insurance companies can collect online customer behavior to tailor products that are more suitable for them personally. Digitization is a challenge for both banks and insurance companies to refine their bancassurance agreements. They must respond to change together and change the way they serve their clients."* (Corporate finance institute, 2022).

The literature identifies five different types of needs associated with (1) loans, (2) insurance, (3) investments, (4) pensions, and (5) life protection. It is possible that all these products are directly connected with insurance products, thus creating bancassurance products (Starita, 2012).

## 4 METHODOLOGY

The aim of this article was to find out the impact and benefits of bancassurance in the current era. To see what this branch of banking has to offer and in which direction it is heading. We have chosen qualitative research to deal with the topic. We have chosen 2 directions for analysing the issue, one direction is the analysis of the current bancassurance market in Slovakia. For the market analysis, we chose the 3 largest banks in Slovakia, namely Slovenská Sporiteľňa, Všeobecná Úverová Banka and Tatra Bank. We looked at their cooperation with insurance companies and their offered insurance products on the market for current clients. The second analysis was the creation of an online questionnaire and its processing. This way we could get deeper into the issue.

Based on an online questionnaire that we sent out via the Facebook social network, we used the Snowball method to reach respondents. We collected a total of 150 responses, which we analyzed step by step. We mainly used comparative methods to analyze the data and descriptive statistics to evaluate our conclusions (Pacáková et al., 2003).

Our research sample consisted of 150 respondents, of which 88 were women and 62 were men. Their age range was from 18 to 76. We were interested in their education, which we classified according to the classification of the Ministry of Education, Science, Research and Sport of the Slovak Republic (MŠVVa Š SR, 2018). 6 respondents only had a primary education, 1 respondent did not have a high school diploma, 76 respondents had a secondary school education with a high school diploma, 14 had a first-level university education, 44 respondents had a second-level university education and 9 respondents had a third-level university education. From this, we assumed that our sample has the necessary education to fill out the questionnaire. We were also interested in where our respondents came from, from a village or a city. We found that 75% came from the city, the rest from the village. We were also interested in their economic status, in total we are 67 students, 76 employed people, 2 unemployed, 2 on maternity leave and 12 retired.



## 5 RESULTS

Analysis of the three largest banks operating on the Slovak market showed that Slovenská sporiteľňa cooperates with three insurance companies, namely Kooperativa poisťovňa, Vienna Insurance Group, Komunálna poisťovňa. Vienna Insurance Group and BNP Paribas Cardif poisťovňa and Slovenská sporiteľňa mainly offers non-life insurance products, within which it provides several types of insurance linked to payment cards issued by the bank. These are primarily products such as travel insurance for payment cards, insurance for purchased goods for credit cards, insurance for personal belongings and cards. All above-mentioned insurances from Slovenská sporiteľňa can be purchased by phone or directly at a bank branch, while the insurance of purchased goods with a credit card is directly linked to selected types of card products. Claims can be reported by email or post, by filling out the form stored on the bank's website (Slovenská sporiteľňa, 2022).

The General Credit Bank (VÚB) is an intermediary of insurance products. He cooperates with two insurance companies, namely BNP Paribas Cardif Poist'ovňa and Generali poisťovňa. VÚB banka offers the widest portfolio of life and non-life bancassurance products. Insurance for payment cards issued by VÚB Bank includes insurance for credit cards, insurance for personal belongings and cards, and travel insurance. Similar to Slovenská sporiteľňa, VÚB banka also offers the purchase of the aforementioned insurances at a bank branch or by phone, and the claim can also be reported in writing by post, email or by phone (VÚB, 2022).

When creating the bancassurance portfolio, Tatra Bank cooperates only with the insurance company UNIQA Pojišťovna. The portfolio offers both life and non-life bancassurance products. Non-life products are most often tied to credit and debit cards. Individual products differ based on the type of card. Tatra Bank offers travel insurance in its portfolio, and cyber insurance is also new on the market. Of the three banks, only Tatra Bank has the option of purchasing both insurances online via the bank's website or via the mobile application, DIALOG live, also at a bank branch. In the same way, reporting of damage is possible online via the website, by mail, at a travel insurance branch. In the case of cyber insurance, assistance services are included in the package (Tatra Bank, 2022).

In the online questionnaire, we asked about the topic of bank insurance using several questions, from which we wanted to find out whether our respondents, all bank clients, have purchased insurance for their payment card or whether or not they have such a service in their portfolio of purchased products. We found that 23.4% of the 150 respondents currently have purchased insurance for their payment card, with an approximately equal share of both men and women. In a deeper analysis of these respondents, we found that employed people were 3 times more interested in this type of insurance compared to university students in our sample.

Later, we asked the respondents who had purchased the aforementioned insurance more questions about their own insurance. In the answers, we gave them a choice of what kind of insurance they currently have. They had a choice of travel insurance, personal belongings and card insurance, cyber insurance, credit card insurance and credit card purchased goods insurance. We found that the most interested respondents are in travel insurance (61.2%).

We were also interested in what was the advantage when deciding to purchase that specific insurance. The most important advantage for the respondents was simple and quick conclusion of the contract. The respondents were also satisfied if the insurance product contained the widest possible range of possible risks. Another important advantage or positive for our respondents was the price of the offered product, they preferred the lowest possible price. Buying insurance online was a big plus.

## 6 CONCLUSION AND DISCUSSION

Our research has shown that interest in insurance in the current bancassurance market exists and is increasingly in demand. Distribution channels are now able to connect much better than in the past. With the help of the Internet and FinTech technology, cooperation between banks and insurance companies can become even more interconnected. By working on this cooperation and development even before the COVID 19 pandemic, it was precisely during this situation that the bancassurance sector proved to be very strong and flexible compared to other sectors.

Using the analysis from our collected data, we found that our respondents were most interested in travel insurance. One of the reasons may be that it is the most frequently offered insurance in all banks. Through further analysis, we found that employed people were more interested in this type of insurance. The reason may be simple, people with more income can afford to travel more than those without income. People also consider it advantageous if the offered insurance product included the widest possible range of risk coverage, which is quite understandable. We also found that people are becoming more interested in cyber insurance.

It is also important to note that for some insurance products, people had the option to purchase the offered insurance online, either through the bank's application, directly on the bank's website or by voice biometrics. It is here that you can see a certain shift in the sales distribution channel, from a physical to an online communication channel.

From the analysis of the selected banks, we found that only Tatra Bank provides the purchase of insurance online through the website or through their application, which is also confirmed by the experience of Exton Consulting. Currently, more and more banks have published offers and sales of insurance online, but few make them available via a mobile application.

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# CRYPTOCURRENCY AS A FORM OF INVESTMENT

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## **Abstract**

The issue we dealt with concerns cryptocurrency as a form of investment. The goal of the research was to find out what type of investors are attracted to investing in cryptocurrencies. We were interested in the reasons for their behaviour. The qualitative methods for research purposes were used. The own created questionnaire was forwarded to our respondents online. The obtained data were analysed with using descriptive statistics. Our sample consisted of 130 people, mostly young people, students under the age of 28. We have found that investing in cryptocurrencies is more attractive to the younger generation, and even a minor failure will not deter them. Young people are trying to invest less capital in various platforms. From this behaviour we can see that the young generation is becoming more financially literate with the help of digitalization of the time.

*Keywords: Cryptocurrency, Blockchain, Investment, Bitcoin*

## **1 INTRODUCTION**

Currently, cryptocurrencies are a very popular topic among economically active people, especially among young students, who can already be considered human capital, which is so much needed today and will be so needed in the future. Investing in cryptocurrencies is constantly growing and this topic is becoming more and more attractive even though investing in cryptocurrencies involves a high risk of losing your deposit.

There are already more than 10,000 cryptocurrencies in the world in 2022 and the number of them is still increasing (Statista, 2022). Although they are called cryptocurrencies, not all of them work on the same principle. Bitcoin is considered the main cryptocurrency; other cryptocurrencies are usually called Altcoins (alternative cryptocurrencies). Well-known Altcoins include, for example, Litecoin, Dogecoin, Ethereum and various others.

The name cryptocurrency was created from two words, which are cryptography and currency (Hosp, 2018). Cryptocurrency is defined as a type of virtual (digital) currency that uses cryptography (encryption) to ensure the protection of important information and against possible counterfeiting. It is a decentralized currency with no link to a central source, meaning it is not subject to any banks or government bodies that could manipulate its value. The real value of a cryptographic currency is determined purely by demand and supply on the market (Janssen, 2017; Petrušek, 2015).

Bitcoin is currently considered the most famous cryptocurrency. Bitcoin became visible in 2008. History says that there were more attempts to create digital currencies before Bitcoin, but only Bitcoin managed to gain global visibility. The company Digicash, later also the operator of the ecash currency, is associated with the first major digital currency in history. Its creator is cryptographer David Chaum. Later, the PayPal service began to be used, which was able to simplify micropayments on the Internet, but it still concerned a typical payment, so-called currencies.

Cryptography is based on mathematical algorithms on the so-called Hash function. This Hash function can rewrite plain text into a combination of numbers and letters. We can therefore define cryptography as a mathematical discipline dealing with encryption, i.e. the transfer of messages to and from a secret form that can only be read with knowledge of the encryption key.

We know several types of cryptography, namely asymmetric cryptography (Stroukal, Skalický, 2018) and symmetric cryptography (Menezes et al., 1997). Asymmetric cryptography is currently used more, it is also because symmetric cryptography creates more inconsistencies and problems. Since it relates to money, it is often a financial type of problem.

An important term for understanding this issue is the term cryptographic wallet. It is based on the procedure that purchased coins are moved to cryptographic wallets, where they are secured with a private key. And the role of these wallets is to protect this private key. Current cryptocurrencies stand mainly on the Blockchain. Blockchain is a certain database of data that is structurally divided into blocks, and these are in turn linked together. Blockchain is thus the basic principle on which the functioning of cryptocurrencies is based. It is a technology that records payments made in a given network, which are verified using mathematical operations, algorithms. Thanks to its function, this technology thus prevents possible forgery and various payment frauds (Crosby et al., 2015). It is a chained set of blocks, and each block is irrevocably linked to the previous one, meaning that it is impossible to make changes without destroying the whole thing. If we were to remove just one block, we would have to remove all the blocks above it as well, causing the entire block chain to collapse. This is very important for understanding how blockchain works (Hosp, 2018).

## **2 METHODOLOGY**

The main goal of the article was to find out the reasons and consequences of investing in cryptocurrencies. In addition to the main goal, we also set three research questions, which we defined as follows:

RQ 1: What type of people invest in cryptocurrencies and why?

RQ 2: Why do not people invest in cryptocurrencies?

RQ 3: Did the negative experience influence the investors' future decision-making?

For the research purposes the qualitative research methods were chosen. With the help of an online questionnaire, a random selection of future respondents was approached through the Facebook platform. The questionnaire was anonymous. 130 respondents answered the questionnaire. The average time to complete the questionnaire was five minutes. The questionnaire contained 4 parts. In the first part, the characteristics of the respondent was investigated, based on answered questions about himself, an image of the respondent was created. The respondents were asked about their age, education, and economic status. The next part was aimed to find out whether a specific respondent had ever invested in cryptocurrency. For some questions, the Likert scale of satisfaction was used. Practically, this means that the respondents had a choice of values from 1-10, from which they had to choose how much they agree with the statement. This type of closed question is usually used to find out the attitude, satisfaction, or experience of the respondent (Survio, 2020).

When determining the gender of the respondents, there were 59 men and 71 women in the sample of 130 respondents. Most respondents were students, which also results from the fact that up to 83 people out of 130 are people younger than 23 years old. Subsequently, most respondents were between the ages of 23 and 28, and from the age of 29 onwards, the ratio drops significantly. Respondents over 41 made up only 10% of the sample. The Snowball method to approach the respondents was used, that is why the research sample includes mostly young people, students. The telling value will precisely touch this young population. The collected data were analysed in MS Excel using descriptive statistics. The individual data were compared and find out the basic statistical indicators which helped in the analysis of the issue.

### 3 RESULTS

We found that out of 130 people in our research sample, 52 respondents have tried cryptocurrency investing, which is 40% of our total sample. The remaining 78 people (i.e. 60% of the sample) have not invested in this type of investment yet. Those who decided to invest in cryptocurrencies were mostly men from the city, studying in college and considered themselves dynamic or balanced investors. In the case of older respondents, they were mostly university educated people.

As a reason for investing, they stated that they find cryptocurrencies attractive. It was true for them that Bitcoin was of course the most popular. A large part also tried investing in Dogecoin, Litecoin, Solana or Ripple. We noticed less popularity among the selected cryptocurrencies with Tether and EOS. In addition to selected cryptocurrencies, cryptocurrencies such as Cardano, Mana, ADA, Shiba Coin and other lesser-known cryptocurrencies were the most common in people's investments.

From the opened question in the questionnaire, we found out what the specific choice of a given cryptocurrency depended on. In most cases, the choice of a specific cryptocurrency depended on the popularity of the cryptocurrency market, the greatest profitability in the past, but also on the advice of acquaintances/advisors. Many investors have chosen cryptocurrencies based on their interest, self-study, reading articles, watching videos on YouTube or other social platforms. In the following table 1, the question regarding the reason for investing in cryptocurrencies is analysed.

Tab. 1 - Reason for investing in cryptocurrencies. Source: own research

The reason for investing in cryptocurrencies	Amount	Percent
I see a future in it/it makes sense to me.	30	34 %
I am attracted by the prospect of high profit.	18	20 %
I just wanted to try it.	16	18 %
An acquaintance/advisor advised me to do this.	14	16 %
Various articles/internet convinced me.	9	10 %
Other.	2	2 %
<b>Sum</b>	<b>89</b>	<b>100 %</b>

We found that 30 respondents, which is 34% of the questioned, chose the answer that they see the future in cryptocurrencies. As can be seen in more detail in Table 1, young people are attracted by the prospect of profit and are also tempted by their curiosity to try something new. 16% of respondents consulted before buying cryptocurrencies and 10% searched for information via the Internet and available articles.

When investing in cryptocurrencies, the respondents used different ways of purchasing them. More than half used a crypto exchange such as Binance, Coinbase, Kraken, Crypto, etc. to buy cryptocurrencies. These exchanges offer clear buying of cryptocurrencies as well as overall easy access that people need. Another popular method was the well-known Fumbi platform, which is known to most Slovaks. The rest purchased cryptocurrencies using a Licensed Online Broker such as eToro, XTB, Plus500 or preferred to purchase cryptocurrencies using a bank account that offers an example of Revolut or Nuri, and only one respondent purchased cryptocurrencies using a cryptocurrency ATM.

Using a Likert scale of satisfaction from 1 to 10, where 1 meant the least agree and 10 the most agree, our respondents rated the statement

*"Cryptocurrencies are the future in the financial world. They can bring uses and innovations that we cannot yet grasp today, and therefore it is better to have bought "this train ticket" precisely by being invested"*

most often with a value of 7 and the average value was the number 6.45 out of 10. This value shows that investing in cryptocurrencies is considered positive and that the young generation of investors definitely sees their future in it.

#### **4 CONCLUSION AND DISCUSSION**

Young people, mostly students, who actively invest in cryptocurrencies state that the possibility of quick earnings as the main reason for investing in cryptocurrencies. Respondents who did not invest in the cryptocurrency market commented on this type of investment that it is very high risk, they feel distrust, fear of losing money, but also that they consider it non-ecological. The majority also admitted that they are not interested in the issue and do not have enough knowledge in this area.

We have found that cryptocurrencies especially attract the younger generation of people, and with increasing age, the number of investors in this type of asset decreases. In relation to gender, men invest in cryptocurrencies more than women, and most investors come from the city. We also found that although older people had net worth, they did not try to invest some of it in this investment asset, unlike younger people who did not have enough funds, but, as they say, had the desire to invest, even if a little. Respondents who identified themselves as dynamic or balanced investors invested in cryptocurrencies.

For respondents who had never invested in cryptocurrencies, we found that it was mainly due to a lack of interest in the issue, and therefore they did not understand the issue that much.

In a deeper analysis, we found that the lived negative experience of investing in cryptocurrencies had a certain influence on the future decision-making of investors. We found that none of the respondents who have already invested in cryptocurrencies ruled out re-investing. Practically, this means that even though investors lost their money while investing or experienced an unpleasant event related to cryptocurrencies, not one of them was firmly determined not to give this form of investment another chance. We think this may also be because most of our research sample were young people under the age of 28, college students who are not afraid to take risks and are not deterred by a single bad experience. They also deal with the issue of cryptocurrencies and follow the current financial market, which means that they already have some financial literacy, which is positive for our society.

The limitations of this research were that it was only done in a qualitative manner. During the data collection there was a real pandemic of COVID 19, so the data was collected online, this was the main limitation of the research. However, research has shown that it has its own meaning. Research has shown that cryptocurrencies are more attractive especially for the younger generation, which in its own way is more flexible and faster in learning new knowledge about finances. Further research could be more in-depth and more specific to the selected factors, and if the researched sample was narrowed, the research would reach better and more specific conclusions that would help to better understand this issue.

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# CONSUMER ETHNOCENTRISM AS A FACTOR OF PERCEPTION OF ORGANIC FOODS? SOME EVIDENCE OF YOUNG SLOVAKS

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## **Abstract**

The presented article focuses on the issue of consumer ethnocentrism as a possible factor affecting the complex perception of organic food. The aim of this article is threefold: (1) measuring consumer ethnocentrism, (2) measuring the perception of organic food, and (3) examining the relationship between consumer ethnocentrism and the perception of organic food. The article is supported by a primary survey focused on Slovaks aged 15-26. From the point of view of methodology, we use a number of scientific-philosophical (analysis, synthesis, scientific abstraction) and mathematical-statistical methods (descriptive and inductive statistics). In this work, we use two tools, namely CETSCALE for measuring consumer ethnocentrism and the newly created tool POFscale for measuring the perception of organic food. The reliability of both instruments was verified on the basis of reliability estimation coefficients, namely Cronbach's alpha. The results suggest that the youth segment achieves a low level of consumer ethnocentrism and a positive perception of organic food. It can also be stated that consumer ethnocentrism does not appear to be a factor in the perception of organic food.

*Keywords:* consumer ethnocentrism, organic food, CETSCALE, POFscale, young Slovaks.

## **1 INTRODUCTION**

Today's consumers are becoming more aware of health and more interested than ever before in the quality of their food. This trend persists worldwide. Organic foods are becoming more popular. The last two decades have seen such rapid growth in organic food sales that this phenomenon needs to be explained. The question is, is it just a fad, or does it reflect a profound change in our modern market and in our personal consumer habits? From the perspective of the global economy, the growing trend towards organic food is destined to have a major impact on a wide range of business sectors, including agriculture, food processing, supermarkets and groceries, fast food chains, restaurants, hotels, schools, etc. Strategic decisions will not be avoided by businesses in each of these sectors, which will have to consider the extent to which they will list organic food products or related services. To make such crucial decisions, companies will need to understand the pros and cons of organic food and, in particular, why consumers tend to have ecological options. The main difference between organic and non-organic (conventional) foods is how the food is produced (Boström, Klintman, 2006). For example, organic foods such as vegetables, fruits, eggs, milk and meat are produced without antibiotics or growth hormones, genetically modified organisms, irradiation or ionizing radiation (a way to preserve food with radiation energy) and without synthetic (human-made) pesticides, herbicides and fertilizers. Organic farmers may use natural pesticides approved for organic food production. Regardless of the many benefits of organic food, there is no doubt that they are more expensive. This is because of their production, which is more expensive. Some organic foods cost twice as much as their conventional counterparts. Consumer behavior is based on motivation, consumers will not pay significantly higher prices unless they are guided by some clear motivation. As in other areas of our society, access to organic food is easiest for those with deeper pockets. Organic foods have an impact on different areas and have advantages and disadvantages for each of them. The first and currently very researched area is the impact

on the environment. The benefits include growing organic food. Organic farming is a sustainable use of land and resources. Likewise, organic farming seeks to protect and promote biodiversity. In contrast, conventional food production, which often involves thousands of kilometers of transport from the place of production to the grocery store, uses oil and gas, which contribute to global warming. Organic farmers talk about more nutritious foods - apples, strawberries, grapes, carrots, milk and cereals, which have higher levels of vitamin C, antioxidants and phenolic acids compared to conventional foods. For example, Organic dairy products and meat also contain the optimal ratio of omega-6 and omega-3 fatty acids. If we talk about organic food, which is often produced locally, there may be an impact not only on awareness in the context of health, but also on supporting the country's domestic production for the country's prosperity, which is the main direction of the concept of consumer ethnocentrism. An important factor in marketing studies and studies of consumer behaviour is consumer ethnocentrism, it predicts the willingness to buy domestic products (Prince 2020). The question therefore arises as to whether potential and existing consumers and customers of organic food can be influenced and directed towards the purchase of organic food in the context of consumer ethnocentrism. In view of the above, the aim of this article is threefold: (1) measuring consumer ethnocentrism, (2) measuring the perception of organic food, and (3) examining the relationship between consumer ethnocentrism and the perception of organic food.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

Consumer ethnocentrism is a psychological and sociological concept describing how consumers buy products based on the country's origin. It focuses on the ethnocentric views of consumers in one country, within a group, on products from another country, outside the group (Shimp, Sharma 1987; Sharma et al., 1995). According to Shimp, explained consumer ethnocentrism as: “The concept is used here to represent consumers' normative beliefs in the superiority of their own countries' products. This perception is postulated to transcend mere economic and functional considerations, and, instead, to have a more noble foundation rooted in morality. That is, consumer ethnocentrism is intended to capture the notion that some consumers believe it is somehow wrong to purchase foreign-made products, because it will hurt the domestic economy, cause the loss of jobs, and, in short, because, from their view, it is plainly unpatriotic” (Shimp 1984). Consumer ethnocentrism is largely influenced by culture (Čvirik, 2019), social culture (Farjoun, Lai 1997) as well as cultural distancing (Guy, Patton 1996). From the literature we can talk about four categories of predictors of consumer ethnocentrism: sociopsychological antecedents (cultural openness, worldmindedness, patriotism, conservatism, collectivism-individualism, animosity, materialism, list of values, salience, dogmatism), economic environment, political environment, and demographic antecedents (Shankarmahesh 2006). The author De Ruyter et al. jointly identified demographic precursors of consumer ethnocentrism (age, gender, education and income), socio-psychological factors such as openness to foreign cultures, patriotism, conservatism and collectivism / individualism (de Ruyter et al., 1998). In a sense, nationalism can also be considered as an aspect of consumer behavior (Najdený et al., 2022). The link between consumer ethnocentrism and willingness to buy is evolving and moderated by age and gender (Josiassen et al. 2011; Čvirik, 2021a). Factors such as gender, marital status and personal income shape the influence of consumer ethnocentrism on shopping behaviour (Akbarov 2021). In Slovakia and the Czech Republic, demographic factors are important factors in consumer ethnocentrism, but not in the same direction and strength, which may be due to cultural differences (Čvirik, 2021a).

Consumer ethnocentrism has a significant impact on the evaluation of food products (Orth, Letal, 2001; Orth, Firbasova, 2003; Čvirik, 2021b, Bryła, 2021), while research in the field of

organic foods shows that they are more suitable, more nutritious and tastier. Along with buying organic food, it is also about being environmentally friendly and supporting local producers (Seyfang 2006). Several authors point out that in the context of organic food (Pino et al., 2012), it is necessary to examine the price of the product, the availability of the product, the information about the product (Lodorfos, Dennis, 2008) as well as the quality and the ecological aspect (Beharrell, 1991). The author Michaelidou states that safety and environmental friendliness are the most important criteria when choosing organic food (Michaelidou 2007). In general, taking care of your health is probably the strongest motivator for buying organic food. These products are perceived as healthier than ordinary products.

### **3 METHODOLOGY**

#### **Aim and sample**

The aim of this article is threefold: (1) measuring the consumer ethnocentrism, (2) measuring the perception of organic food, and (3) examining the relationship between consumer ethnocentrism and the perception of organic food.

The article is supported by a primary survey. The population was defined as "Consumers of Slovak nationality aged 15 to 26 years." As can be seen, the population contains two criteria - ethnic (Slovak nationality) and sociodemographic (age). The reason for the restriction in the context of nationality is logical given the fact that the measurement of consumer ethnocentrism is oriented towards one nation. For this reason, the degree of consumer ethnocentrism cannot be measured without identifying nationality. The age limit is due to the orientation of research to a group of young people, based on European and Slovak recommendations within the age definition of the youth segment (Ministry of Education of the Slovak Republic, 2005), which can contribute to objectification and possible international comparison of research. 214 respondents became the basis for our primary survey, of which 77 (36%) were men and 137 (64%) were women. The mode for age was 22 years.

*Based on the set goal and the parameters of population, we determined research questions (RQ):*

*RQ1: How can the perception of organic food be characterized in the segment of young consumers?*

*RQ2: What is the level of consumer ethnocentrism in the segment of young consumers?*

*RQ3: How can the relationship between the perception of organic food and consumer ethnocentrism be interpreted?*

#### **Research tools**

The primary survey was conducted using an online questionnaire. In addition to filtering questions (age and nationality), respondents answered 13 questions focused on the perception of organic food and 17 questions focused on measuring consumer ethnocentrism.

In the case of examining the perception of organic food, we created a tool for measuring perception based on the literature, which we called the Perception of Organic Food Scale (POFscale). Respondents responded to 13 statements on a seven-point Likert scale (1-strong disagreement; 7-strong disagreement). To measure the degree of consumer ethnocentrism, we used the CETSCALE tool (Shimp, Sharma, 1987), which is quite often used in the scientific sphere. Respondents responded to 17 statements using the Likert scale, which contained five levels (1-strong disagreement, 5-strong agreement). As this is a new instrument (POFscale) and a downloaded instrument (CETSCALE), it was necessary to verify their reality. To estimate

reliability, we used the coefficient of estimation of reliability - Cronbach's  $\alpha$ . We recorded the results of the reliability calculation as well as the if item dropped method for the POFscale tool in Tab. 1.

Tab. 1 - Estimate the reliability of the POFscale. Source: Own calculations.

POFscale items	Cronbach's $\alpha^{**}$
1. Organic food is expensive. *	0.830
2. Organic food is delicious.	0.803
3. Organic food is good quality.	0.792
4. Organic food is healthy.	0.798
5. Organic foods are nutritious.	0.792
6. Organic foods contain more vitamins than others.	0.802
7. Organic food is harmful. *	0.817
8. Organic food is overpriced. *	0.840
9. Organic food is beneficial to life	0.798
10. Organic foods contain more minerals.	0.806
11. Organic foods contain more antioxidants	0.808
12. Organic foods have a better smell.	0.805
13. Organic food is safer.	0.803

Notes: \* Reverse encoding; \*\* Overall Cronbach's  $\alpha = 0.820$ ; CI =  $\langle 0.782 - 0.853 \rangle$ .

As possible from Tab. 1 shows that the overall reliability estimate based on Cronbach's is 0.820. Of course, this is an estimate, so it is appropriate to work with a confidence interval (CI = 95 %), which corresponds to the level of estimation of Cronbach's  $\alpha$  in the range from 0.782 to 0.853. From the above, it can be stated a high degree of estimation of the reliability of the research tool. Using the if item deleted method, we examined the suitability of individual statements in the tools. In other words, we investigated whether removing any of the statements would not be more reliable. It may be considered that statements 1 and 8 should be clarified. However, as it is at a reliable interval, we will continue with the research tools in the original version.

The results of the reliability calculation as well as the method, if the item decreased for the CETSCALE tool, were recorded in Tab. 2.

Tab. 2 - CETSCALE reliability estimate. Source: Own calculations.

CETSCALE items*	Cronbach's $\alpha^{**}$
1. Slovak people should always buy Slovak-made products instead of imports.	0.869
2. Only those products that are unavailable in the Slovak Republic should be imported.	0.868
3. Buy Slovak-made products, keep Slovak Republic working.	0.880
4. Slovak products, first, last, and foremost.	0.875
5. Purchasing foreign-made products is un-Slovakian.	0.875
6. It is not right to purchase foreign products, because it puts Slovaks out of jobs.	0.869
7. A real Slovak should always buy Slovak - made products.	0.873
8. We should purchase products manufactured in Slovak Republic instead of letting other countries get rich off us.	0.868
9. It is always best to purchase Slovaks products.	0.871
10. There should be very little trading or purchasing of goods from other countries unless out of necessity.	0.865
11. Slovaks should not buy foreign products, because this hurts Slovaks business and causes unemployment.	0.870
12. Curbs should be put on all imports.	0.872
13. It may cost me in the long-run but I prefer to support Slovak products.	0.880
14. Foreigners should not be allowed to put their products on our markets.	0.877
15. Foreign products should be taxed heavily to reduce their entry into the Slovak Republic.	0.870

16. We should buy from foreign countries only those products that we cannot obtain within our own country.	0.865
17. Slovak consumers who purchase products made in other countries are responsible for putting their fellow Slovaks out of work.	0.874

Note: \* Based on Shimp and Sharma (1987). \*\* Overall Cronbach's  $\alpha = 0.879$ ; CI = <0.854 – 0.900>.

From Tab. 2 shows a high rate of estimating the reliability of a research tool using Cronbach's  $\alpha$  (Cronbach's  $\alpha = 0.879$ ). As we work with a certain error rate (5%), we will consider Cronbach's  $\alpha$  in the context of the confidence interval, which is at the level of 0.854 - 0.900. Using the if item dropped method, it would be appropriate to examine statements 3 and 13 in more detail in the future, and there are indications that this would increase the reliability of the research tool. However, since the individual values of Cronbach's  $\alpha$  if item dropped are in the confidence interval, we will work with the research tools in the original version.

## 4 RESULTS

In the following section, we will proceed in the context of the set goal, focusing on answering research questions (RQ).

*RQ1: How can the perception of organic food be characterized in the segment of young consumers?*

We have created the POFscale tool to examine the perception of organic food in the segment of young consumers. The instrument contained 13 statements, with respondents responding to individual statements on a seven-point Likert scale. We recorded the basic descriptive statistics for individual statements in Tab. 3.

Tab. 3 - Mean and standard deviation for POFscale. Own calculations.

POFscale items	Mean	St. dev.
1. Organic food is expensive. *	2.31	1.04
2. Organic food is delicious.	5.17	1.12
3. Organic food is good quality.	5.32	1.07
4. Organic food is healthy.	5.40	1.06
5. Organic foods are nutritious.	5.35	0.99
6. Organic foods contain more vitamins than others.	4.33	1.27
7. Organic food is harmful. *	5.18	0.88
8. Organic food is overpriced. *	2.72	1.31
9. Organic food is beneficial to life	5.03	1.09
10. Organic foods contain more minerals.	4.37	1.05
11. Organic foods contain more antioxidants	4.30	0.94
12. Organic foods have a better smell.	4.30	1.26
13. Organic food is safer.	4.72	1.21

Note: \* Reverse encoding.

If from Tab. 3 shows that respondents perceive organic food as expensive and overdue. However, in the context of sensory and nutritional properties, respondents report above-average values on average (the mean value of the scale is 4 points).

If we want to evaluate the perception in terms of the instrument, it is necessary to state that the values will range from 13 points to 91 points (13 statements on a 7-point scale). The average value was at the level of 58.5 points (the standard error of the average was at the level of 0.55). The standard deviation was at the level of 8.09 points. The median and mode were at the level of 58 points. It can be stated that the perception of organic food in the segment of young people is above average, which indicates a positive perception.

*RQ2: What is the level of consumer ethnocentrism in the segment of young consumers?*

Measurement of consumer ethnocentrism was performed on CETSCALE (Shimp, Sharma, 1987). We recorded the average values and standard deviations for individual statements in Tab. 4.

Tab. 4 Mean values and standard deviation for CETSCALE. Source: Own calculations.

CETSCALE items*	Mean	St. dev.
1. Slovak people should always buy Slovak-made products instead of imports.	2.79	1.17
2. Only those products that are unavailable in the Slovak Republic should be imported.	3.13	1.17
3. Buy Slovak-made products, keep Slovak Republic working.	4.01	0.84
4. Slovak products, first, last, and foremost.	3.15	1.04
5. Purchasing foreign-made products is un-Slovakian.	1.55	0.76
6. It is not right to purchase foreign products, because it puts Slovaks out of jobs.	2.19	0.91
7. A real Slovak should always buy Slovak - made products.	1.76	0.85
8. We should purchase products manufactured in Slovak Republic instead of letting other countries get rich off us.	3.06	1.07
9. It is always best to purchase Slovaks products.	2.91	1.07
10. There should be very little trading or purchasing of goods from other countries unless out of necessity.	2.64	1.01
11. Slovaks should not buy foreign products, because this hurts Slovaks business and causes unemployment.	2.33	0.96
12. Curbs should be put on all imports.	2.33	1.09
13. It may cost me in the long-run but I prefer to support Slovak products.	3.27	1.07
14. Foreigners should not be allowed to put their products on our markets.	1.44	0.68
15. Foreign products should be taxed heavily to reduce their entry into the Slovak Republic.	1.99	0.93
16. We should buy from foreign countries only those products that we cannot obtain within our own country.	2.75	1.18
17. Slovak consumers who purchase products made in other countries are responsible for putting their fellow Slovaks out of work.	2.01	0.83

Note: \* Based on Shimp and Sharma (1987).

If from Tab. 3 shows that many statements were below average. In the context of the standard deviation, it can be assumed that the respondents were relatively consistent in their answers.

As the instrument contains 17 statements and a five-point Likert scale was used in the overall evaluation for the instrument, the results will be in the range of 17 to 85 points. The average level of consumer ethnocentrism is 43.29 points (standard error 0.67). The median was 43 points and the mode was 46 points. The standard deviation was 9.79 points. Overall, we rate the rate of consumer ethnocentrism as below average (approximately 39 %).

*RQ3: How can the relationship between the perception of organic food and consumer ethnocentrism be interpreted?*

To examine the relationship between the two research tools, we decided to use correlation analysis, which will tell us (1) whether there is a relationship, (2) how strong and (3) what is its character. Due to the nature of the data, we used Pearson's correlation coefficient. The results of the correlation analysis in the form of a correlation matrix were recorded in Tab. 4.

Tab. 4 Results of correlation analysis (CETSCALE and POFscale). Source: own calculations.

		CETSCALE	POFscale
CETSCALE	Pearson Correlation	1	0.099
	Sig. (2-tailed)		0.147
	N	214	214
POFscale	Pearson Correlation	0.099	1
	Sig. (2-tailed)	0.147	
	N	214	214

In the context of the correlation coefficient (Tab. 4), the relationship can be described as trivial with a positive tendency. We verified this coefficient using elements of inductive statistics. The results suggest that the relationship between the variables is random and cannot be generalized.

## 5 DISCUSSION

The presented article focuses on the study of the influence of consumer ethnocentrism on the perception of organic food. Measurements of organic food perception were performed on a newly created tool called POFscale. This tool was created on the basis of scientific theory and pilot testing. The reliability of the tool was also verified. For the needs of measuring consumer ethnocentrism, we used CETSCALE, while verifying the reliability of the instrument. It should be noted that there are indications that the level of reliability could be increased. The problem areas concerned price sensitivity. This finding is important in the context of both concepts, as it indicates the high sensitivity of young consumers in Slovakia, which may be a manifestation of deteriorating economic and political conditions in Slovakia. Price sensitivity may have skewed results to some extent, but cannot be ruled out for objective reasons.

It can be stated that young Slovaks perceive organic food in the context of sensory and nutritional values better than standard foods. Their price can be a problem. It would therefore be appropriate to recommend organic food producers to reconsider their pricing strategies. In the context of consumer ethnocentrism, we have seen a low level of consumer ethnocentrism. This fact can also be caused by the deteriorating perceived situation not only in Slovakia but also in the world, where the impact of the pandemic and the war also has a significant effect on consumer behaviour.

Even organic foods are usually local and their purchase can support the Slovak economy, which is a basic principle of consumer ethnocentrism, the relationship between these concepts has not been proven. It can thus be assumed that in the youth segment there is no relationship between the degree of consumer ethnocentrism and the perception of organic food.

The presented article also contains considerable limits. The nature of the sample, which limits interpretation, can also be considered a limit. Inquiry as the basic method of primary research brings limits in the form of various effects that can cause distortion of respondents' answers. In the context of the results, several limits can be stated, which we try to remove using mathematical and statistical methods.

In the future, it would be appropriate to explore other segments. It would also be appropriate to examine other factors affecting the concepts studied. The newly created tool (POFscale) has shown high reliability. In the future, it would be appropriate to research with the help of this tool in other countries and thus create an international comparison.

## 6 CONCLUSION

The aim of the presented article was (1) to examine the perception of organic food in the segment of young consumers, (2) to measure the degree of consumer ethnocentrism and (3) to examine the impact of consumer ethnocentrism on the perception of organic food.

Based on the primary survey in the segment of young Slovaks, we concluded that (1) the perception of organic food is above average positive, while the researched segment positively perceives organic food in the context of sensory and nutritional properties and negatively perceives the price of organic food. The rate of consumer ethnocentrism (2) is well below average, indicating that this factor is not very significant on average. It can also be stated that (3) there is no relationship between consumer ethnocentrism and the perception of organic food.

The results can be applied in marketing and business, as well as in sociology and psychology. The results can be applied in theory and practice. The results are suitable for adaptation within marketing strategies, segmentations as well as the profile of a standard customer. The study offers incentives for marketing communication. In the context of the price strategy, a reassessment may be recommended, with the possibility of price reduction, a strategy of price discrimination or clarification (marketing communication) of the correctness of the higher price.

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# IMPULSIVE BUYING BEHAVIOUR: GENERATION Z

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## **Abstract**

Paper is focusing on impulsive buying behaviour and generation Z. Generation Z was chosen because this generation will be in near future in productive year. And it is important to know, how they are sensitive on impulsive buying behaviour. For research was collected 148 questionnaires and for analysis was used 120 questionnaires. It was found, there is relationship between reason of impulsive purchase and impulsive buying behaviour and relationship between gender and impulsive buying behaviour, and it wasn't found relationship between free funds to spend and impulsive buying behaviour. Research was looking into product category which was bought impulsively by generation Z in last 6 months. Most sold product category impulsively were clothes and entertainment.

*Keywords: impulsive buying, generation Z, buying behaviour, product categories*

## **1 INTRODUCTION**

Lot of customer's purchases are made in retails, and impulsive purchases are made in retail stores and supermarkets (Pradhan, 2016), so it is important that marketers are thinking about strategic and tactic aspects of retail. These aspects are store location, store image, physical environment, services, pricing strategies, supplier selection, products, and their brand selection. These aspects can lead to impulsive purchases. (Mulhern, 1997, Hariga et al., 2007). Nicholls et al. (2001) stated that these strategies are important because impulsive purchases are made in almost 60 % cases. Bell et. al (2013) stated 70 % of purchases are not planned. Nishanov and Ahunjonov (2016), Matila and Wirtz (2001) and Akram et al. (2016) agreed, that store environment can lead to impulsive purchases. Hariga et al. (2007) continue, that retail industry is very important for economic of country, in this industry is lot of competitors (differences in quality, prices and services), usually low profit margins and customers with specific demands.

Customers can be influenced to buy impulsively by factors, as store environment, personal traits, situational factors or cultural factors (Muruganatham, Bhakat, 2013) and Coley and Burgess (2019) found out there are gender differences, women are more affected by impulsive buying than men. Last twenty years impulsive buying was increased as a result of economic and social improvements, specially thanks to bigger personal income (Park, 2011).

## **2 THEORETICAL BACKGROUND**

### **Impulsive buying behaviour**

As Rook (1987) and Piron (1991) said, that impulse buying is when consumer has need to buy something immediately, impulsive purchase is unplanned as a result of stimulus.

Impulsive behaviours are influenced by internal (everything what is connected to customer) and external (environment) factors (Karbasivar and Yarahmadi, 2011). Xu (2007) added situational factor, it includes store location, specific time, purchasing habits. Kacen and Lee (2002) add cultural factor. Chowdhury and Mehjabeen (2021) said that cultural factor is most powerful in impulse buying behaviour. As was mentioned impulse buying can be influenced by personal characteristics, as is level of impulsive tendencies (bigger impulsive tendency = more impulsive

purchases), shopping pleasure or level of self-control (Youn & Faber, 2000). Impulsive tendency is connected to impulsive purchasing behaviour (Utama et al., 2021).

Research of Utama et al. (2021) compared in his research categories of products which are impulsively purchased. This research was done in shopping centre. The most impulsive purchases were made in food, home appliances and fashion. Another research focused on impulsive behaviour and product categories is research of Pradhan (2016), personal care products, foods and fashion were the most impulsively purchased. In Coley and Burgess (2019) research, they figured out, that t-shirts and sweaters, personal cares and entertainment were the most affected by impulsive purchasing. Đukić a Stanković (2021) were focusing too on product categories bought mostly impulsively, these products were foods, personal care products and fashion. On impulsive purchase have influence sales, showcase of products (shelves, wobblers, posters) and store atmosphere (music, light, colors). In Parsad, Prashar and Vijay (2021) research respondents bought in 2021 mostly fashion products. With all these results agreed Shukla (2020). Bell et. al (2013) found out if customers are longer in stores, they are buying impulsively more, another finding is if customer have time to spend in stores, they often buy something impulsively than someone who don't have time. Most impulsively purchased products were foods, followed by personal care products.

Akram et al. (2016) said that age has influence on impulsive behaviour and store atmosphere has influence on impulsive behaviour. Matilla and Wirtz (2008) agreed with Akram et al. and added that environmental factors have the role on impulsive behaviour in retail.

Different gender has different tendency to make an impulsive purchase. As Tifferet and Herstein (2012) stated, due to touch product women are more affected by impulsive purchase than men. With this agree Coley and Burgess (2019) and Utama et al. (2021). With them disagree Akram et al. (2016), they didn't find a relationship between gender and impulsive buying behavior. But Coley and Burgess (2019) added that men are buying impulsively these products: Music CDs or DVDs and spending money in Entertainment, women are likely buying impulsively Shirts, sweaters, pants, skirts, shoes and products for health and beauty and magazines/books. The main reason of purchases was by positive buying emotion (men and women). Đukić a Stanković (2021) were looking for answer if discounts are powerful motive for impulsive purchase, they found out, that discount are.

### **Store environment**

Information that stores environment led to impulsive purchases support lot of researchers. Baker, Grewal a Parasuraman (1994) stated, that store characteristic influence opinion of customer about products and quality of services in store. Pollák et al. (2021) and Ogruk et al. (2018) found out, that store environment (perfectly set) and seller with positive mood led to better mood of customer, better mood of customer lead to buying more products. Store environment can be divided into three categories:

1. Environment factors – music, lightning, smell,
2. Appearance factors – floor, walls, colors, cleanliness, ceiling, wide aisle, product layout, brands,
3. Social factors – salesman. (Baker et al., 1994)

## Generation Z

Generation can be defined as group of people with specific age. They were formed with similar factors, conditions, technologies, and life events (wars, crisis etc.). Generation has similar opinions, habits, and motivation to buy something. (Kupperschmidt, 2000, Kahawandala et al., 2000)

Generation Z can be defined as a group born in 1995-2005. Every defined year different. Pham et al. (2021) stated 1995-2003, Bharadwai (2020) stated 1994-2015, Kahawandala, Peter and Niwunhella (2020) stated 1995-2000, Rahayu (2020) stated 1994-2004). This generation can be characterized by high computer literacy, and they are living with social media (Facebook, WhatsApp), on social media they spent 3-6 hours per day, they are watching movies online, and they goal is work and have fun in online world (Grigoreva a kol., 2021, Peter a Niwunhella, 2020).

Simangunsong (2018) stated, that marketers should know, how to impress generation Z, that can lead to different strategy in business, Vojvodić (2019) continue stores should improve services and satisfy generation Z needs by using new innovative technologies in stores. Digital elements in store can have influence on impulsive behaviour of generation Z (Priporas a kol., 2017).

## 3 METHODOLOGY

The data for examining hypotheses were collected with questionnaires. Before data collection was questionnaire pretested by group of people. The questionnaires were designed to determine information about impulsive buying. There were one criterium for questionnaire and it was, that respondents belong to generation Z. Based on literature review year of born of this group was set to 1995-2005.

Based on literature review there were set hypotheses (Nishanov and Ahunjonov, 2016, Matila and Wirtz, 2001, Akram et al., 2016), Coley and Burgess, 2019, Park, 2011, Tifferet and Herstein, 2012, Utama et al., 2021, Đukić a Stanković, 2021):

*H1: There isn't relationship between reason of impulsive purchase and impulsive buying behaviour.*

*H2: There isn't relationship between gender and impulsive buying behaviour.*

*H3: There isn't relationship between free funds to spend and impulsive buying behaviour.*

And there was one question objective: Find the product category which was the most bought impulsively.

Questionnaire contains of 8 questions. First question was filtering question, and it asked if respondent was born in 1995-2005 (if not, questionnaire was ended). Second one was how often respondents let themselves influence by impulsive purchase in last 6 months (every day, 2-3x per week, 1 per week, 2-3x per month, 1x per month, less then 1x per month). Third question was about which categories of product respondent impulsively bought in last 6 months, it contains these 14 categories – fashion, shoes, accessories, electronics, hardware products, home furnishing, software, music/movies (CD/DVD), sport equipment, entertainment (theatre, cinema, toys, hairdresser, etc.), health and beauty, magazines/books/paper products, transportation (car, bicycle). These categories were chosen by research of Coley and Burgess (2003) and some categories were added by consumer basket. Fourth question asked respondents where they buy impulsively in last 6 months (Store, E-Shop), next question was the reason why respondents bought product impulsively (store atmosphere, product, sales, advertisement,

friends/family, mood (positive/negative), last three questions were for identification respondents (gender, social status, free funds to spend).

Data will be analysed by t-test and by ANOVA, there will be used means and tables for analysis.

Data was collected from 30<sup>th</sup> March to 20<sup>th</sup> April. Total of 148 questionnaires were collected and for other analysis was used 120 questionnaires, 28 was irrelevant. Questionnaire was collected from 74 men and from 46 women. Questionnaire was sent over group of young people on internet (Discord App) and was sent too to the students on university. Respondents were from Czech Republic and Slovakia.

## 4 RESULTS

*H1: There isn't relationship between reason of impulsive purchase and impulsive buying behaviour.*

Tab. 1 – Reason of impulsive purchase. Source: own research

Option	Number	Sum	Mean	Variance
Product	49	231	4,714286	1,375
Discount	31	116	3,741935	2,131182796
Advertisement	1	6	6	
Family, friends	9	43	4,777778	2,694444444
Mood	30	142	4,733333	2,064367816

Tab. 2 – ANOVA of first hypothesis. Source: own research

ANOVA

Source of variability	SS	Difference	MS	F	P value	F krit
Between	24,60896	4	6,15224	3,347441783	0,012431	2,450571
All	211,3577	115	1,837893			
Sum	235,9667	119				

One option is missing – store atmosphere, reason was, that no one choose store atmosphere as a reason of impulsive purchase. 49 respondents choose product as a main reason, 31 respondents choose discount and 30 choose mood (positive/negative).

As can be seen in table, p value is smaller than 0,05. So, it means we can reject null hypothesis, and accept alternative. There is relationship between reason of impulsive purchase and impulsive buying behaviour.

*H2: There isn't relationship between gender and impulsive buying behaviour.*

Tab. 3 – T-test - Gender and impulsive buying behaviour. Source: own research

	<i>Impulsive buying behaviour - men</i>	<i>Impulsive buying behaviour - women</i>
Mean	4,972972973	3,695652174
Variance	1,314328027	2,083091787
Number	74	46
F	0,630950606	
P(F<=f) (1)	0,039533322	
F krit (1)	0,649687639	

As can be seen in table, p value is smaller than 0,05. So, it means we can reject null hypothesis, and we can say, there is relationship between gender and impulsive buying behaviour.

*H3: There isn't relationship between free funds to spend and impulsive buying behaviour.*

Tab. 4 – Free funds to spend and impulsive buying behaviour. Source: own research

<i>Option</i>	<i>Number</i>	<i>Sum</i>	<i>Mean</i>	<i>Variance</i>
less than 1000 crowns	24	105	4,375	2,505435
1001 - 2500 crowns	23	100	4,347826	2,328063
2501 - 5000 crowns	33	149	4,515152	1,820076
5001 - 10000 crowns	18	83	4,611111	1,663399
10001 - 20000 crowns	9	36	4	2,25
more than 20000 crowns	13	65	5	1,333333

Tab. 5 – ANOVA of third hypothesis. Source: own research

ANOVA

<i>Source of variability</i>	<i>SS</i>	<i>Difference</i>	<i>MS</i>	<i>F</i>	<i>P value</i>	<i>F krit</i>
Between	6,604073	5	1,320815	0,656484	0,657163	2,293911
All	229,3626	114	2,011953			
Sum	235,9667	119				

Mostly answered option was, that respondents have 2501 – 5000 crowns (33) free funds for spending. Less than 1000 crowns have 24 respondents for spending. With almost same number respondents (23) said that they have 1001 - 2500 crowns as free fund to spend.

In table is shown, that p value is bigger than 0,05, so it means we can't reject null hypothesis. It means, there isn't relationship between free funds to spend money and impulsive buying behaviour.

Question objective: Find the product category which was the most bought impulsively.

Tab. 6 – The title of the table. Source: own research

Category	Summary	Mean	Men	Men - mean	Women	Women - mean
Clothes	53	0,44	17	0,23	36	0,78
Shoes	26	0,22	14	0,19	12	0,26
Accessories	25	0,21	8	0,11	17	0,37
Electronics	33	0,28	30	0,41	3	0,07
Hardware products	5	0,04	5	0,07	0	0
Home furnishing (furniture, lightning, kitchen accessories)	11	0,09	6	0,08	5	0,11
Software	28	0,23	27	0,36	1	0,02
Music, movies – CD, DVD	8	0,07	6	0,08	2	0,04
Sport equipment	12	0,1	6	0,08	6	0,13
Entertainment (cinema, theatre, hairdresser, toys etc.)	44	0,37	27	0,36	17	0,37
Health and beauty	25	0,21	4	0,05	21	0,46
Magazines, books, paper products	13	0,11	4	0,05	9	0,20
Transportation (car, bicycle, etc.)	4	0,03	4	0,05	0	0

As we can see in table, respondents bought impulsively in last 6 months clothes (53) and invest in entertainment (44). Men bought impulsively mainly electronics (30) and software (27) with invest in entertainment (27). Women bought impulsively clothes (36) and products for health and beauty (21). We can see differences between men and women, gender bought impulsively different products.

## 5 CONCLUSION

From results we found out relationships between reason of impulsive purchase and impulsive buying behaviour and relationship between gender and impulsive buying behaviour. We didn't found relationship between free funds to spend and impulsive buying behaviour.

We can agree with Tifferet and Herstein (2012), Coley and Burgess (2019) and Utama et al. (2021), because we found out relationship between gender and impulsive buying behaviour and we can agree that women are buying more impulsively than man. With Coley and Burgess (2019) we have found same results in men investing impulsively in entertainment and with that, women are buying impulsively clothes and health and beauty products.



Park (2011) said that impulsive buying was increased thanks to bigger personal income, but we didn't find a relationship between free funds to spend and impulsive buying behaviour.

Future research should focus on specific reason of impulsive purchase and its effect on impulsive buying behaviour.

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# ANALYSIS OF COOLING OF THE NFT MARKET IN 2022: STRUCTURE AND SEGMENTS EXPLORATION

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## **Abstract**

The NFT (Non-Fungible Tokens) market significantly cooled in the first half of 2022 compared to the second half of 2022. The paper provides an NFT market changes analysis using descriptive statistics and comparing structural changes of segments and totals trade in the number of sales and trade volume dimensions. NFT market noticeably decreased trade volume between periods. Many new approaches and applications of NFT appeared during the explored time, like the new metaverse categories or growing utility category, thanks to the new vision in NFT applications in the real world. Niche marketplaces for NFT trading focus on primary categories, but tremendous leading bitcoin players like Binance and Coinbase add NFT trading tools. In the case of a continuous evolution of the NFT market, the classification of NFT is a complex question, as described in the paper. The NFT market overall has no agreement or standard to classify NFT, which makes the task of detail analysis very complex. During the market development, older NFT projects and categories do not disappear; they are still in the game and keep a similar market share between segments. With descriptive statistical analysis, the paper shows that all categories according to NonFungible Corporation data are alive and adapt to the new market conditions. The results demonstrate the overall NFT market state and provide analytical information to further NFT's future evolution understanding.

***Keywords:** NFT, non-fungible tokens, NFT trade, marketplaces, descriptive analysis*

## **1 INTRODUCTION**

There is considerable interest in Non-Fungible Tokens (NFT) marketplaces and collections. Although the NFT concept became long before the Ethereum invention, much attention has been given to NFT since the start of 2021. The digital work *Everydays: The First 5000 Days* by the artist Beeple was sold for more than 69 million USD in March 2021 (Riegelhaupt, 2021). For the first time, a traditional auction house offered a digital object based on NFT. In 2021, the volume of transactions in the NFT market exceeded 11 billion USD (Statista, 2022). The volume of transactions with Ethereum smart contracts associated with NFT was at least 44.2 billion USD (Chainalysis, 2022). The Collins dictionary proclaimed NFT as the word of the year 2021 and highlighted the digital revolution's impact on culture, interpersonal relationships, and business models (Shariatmadari, 2021).

Trading NFTs and related digital assets are not just about art. This object can be created in any digital form – an image, a photo, a video, an animation, a sound record, a source code, a computer program, etc. The issues of using and penetrating NFTs are closely connected with significant changes in technologies and their impacts on business models. IT companies and start-ups have already started building metaverses – platforms based on virtual and augmented reality technologies, which could be the next generation of communication tools (Bradshaw & Murphy, 2021). The "digital twin" is also penetrating the traditional spheres of the economy – the creation of digital copies of clothes is a new trend in the fashion industry (Gopani, 2021).

Despite the success of NFTs in 2021, the start of 2022 brought a significant decline in the NFT market. The increasing losses and drop of almost 50% in sales in 1Q 2022 have shown substantial changes in NFT trade (NonFungible Corporation, 2022a). However, it might be a

mistake to look into the market as a single entity because of the many categories of NFTs and the different behavior of the market participants. NFT has recently gotten academic attention, but the number of studies is still limited. Particularly, a research gap exists related to examining the current dynamics of the NFT market.

This paper aims to describe and explain the structure of the existing market of NFTs and its development from July 2021 to June 2022. Using available data and studying current research, the authors visualize and examine the five categories of NFTs on the number and volume of transactions and the average price. In the first half of 2022 the sales volume of trading for the NFT groups are significantly changed according to previous half of year. The main research question is, what are the differences in the NFTs categories considered in the first half-year of 2022 compared with the second half-year of 2021.

The remainder of the paper has the following structure: Section 2 presents an overview of the Blockchain and NFT concepts, as well as focuses on the current development of the NFTs market. Section 3 introduces the methodology part. Section 4 presents the obtained results, and Section 5 deals with the paper's contributions in the context of related works. Section 6 focuses on the conclusions from this study.

## **2 THEORETICAL BACKGROUND**

### **2.1 Blockchain technology and Non-Fungible Tokens**

The popularity of blockchain technology is associated with the cryptocurrency Bitcoin and its anonymous creator, Satoshi Nakamoto, who in 2008 described the main principles of technology (Nakamoto, 2008). In a simplified way, a blockchain can be imagined as a distributed digital ledger of records where transactions (chains of blocks) are linked in a logical and chronological order. A new block cannot be deleted after it is verified and saved in the chain. Cryptography and transaction verification ensure the entire system's integrity (Firsova & Abrahám, 2021). Due to its openness, a particular blockchain network can be public (e.g., the Bitcoin network) or private, and it can be a network within a consortium.

The beginning of the use of blockchain technology was marked by the development of Bitcoin and other cryptocurrencies; in 2014 came the second generation of solutions that made it possible to program and implement smart contracts. Smart contracts allow parties who do not know or trust each other to enter into a contract, with the task of controlling the implementation of the contract terms (transfer of assets) lying on the code in the blockchain network (Regner et al., 2019). Ethereum became the first protocol supporting smart contracts in 2014 (Buterin, 2014). Ethereum has been the foundation for many emerging technologies, such as DeFi (Decentralized Finance), DAOs (Decentralized Autonomous Organizations), and NFTs (Despotovic et al., 2022). Although new solutions and technologies have occurred (e.g., Axie Infinity, Flow), Ethereum remains the main blockchain in NFT transactions, with 78% of the entire market (NonFungible Corporation, 2022b).

Changes in Ethereum standards (including the introduction of new standards Ethereum Request for Comment, ERCs) were caused by the need to consider the difference between fungible and non-fungible tokens. Each fungible token is identical to another token on the same network and can be exchanged without loss or gain (comparable to a commodity or fiat money). Fungible tokens are used in cryptocurrencies mostly, but a non-fungible token, on the other hand, cannot be split or merged, and the value of one NFT will not necessarily equal the value of another. (Chohan, 2021; Regner et al., 2019; Wang et al., 2021). The process of creating NFTs (i.e., recording the metadata and digital content of NFT on the blockchain, verifying, and timestamping) is called "mining" (Kostick-Quenet et al., 2022).

**2.2 Current situation in NFT market**

In 2021, the NFTs market experienced enormous growth – the second half of the year saw an increase in the key indicators of trade volume, the number of transactions, and the average price of NFTs (see Figure 1). Significant deviations have been caused by the release of new NFT collections or the sale of individual items at extraordinarily high prices (e.g., the sale of one Cryptopunk NFT for 532 million USD in November 2021).

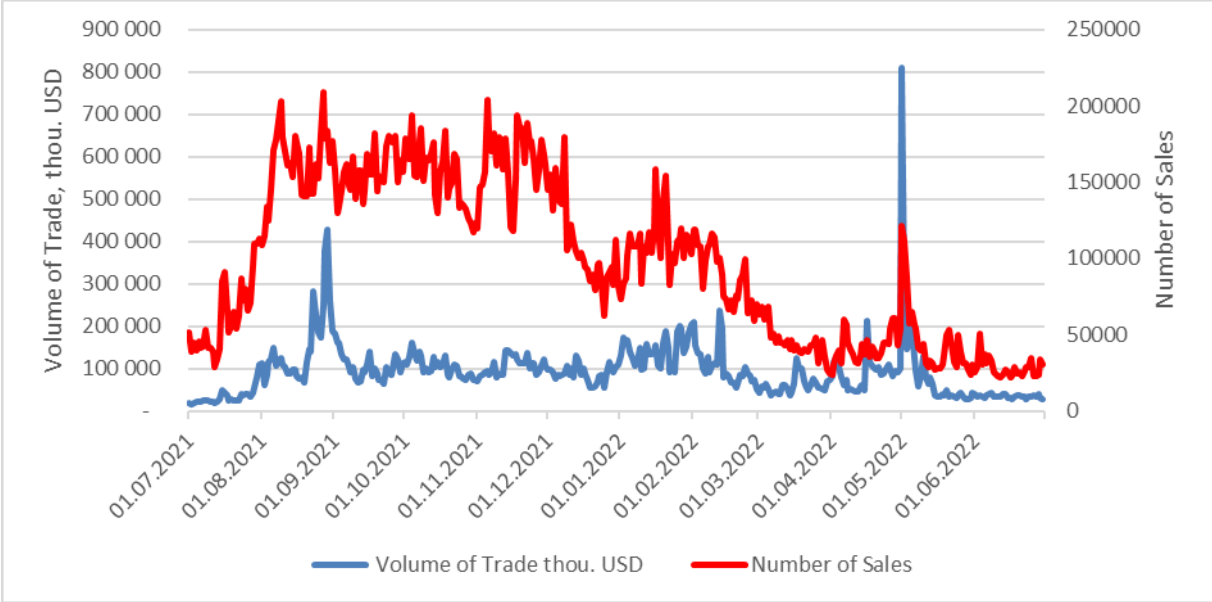


Fig. 1 – Volume of Trade and Number of Sales in NFT market, July 2021-June 2022. Source: own research, NonFungible.com

In terms of size, NFT transactions can be divided into retail (up to 10,000 USD), collector-sized (between 10,000 and 100,000 USD), and institutional-sized transactions (more than 100,000 USD). According to the NFT market analysis for 2021, most transactions were at the retail level. However, collector-sized and institutional-sized participants play a big role in trade volume. Collector-sized users had 60% of the NFT transaction volume in 2021. Institutional-size accounts had about 30% of the volume of trade. However, it was investigated that the NFT market is rather retail-driven than the traditional cryptocurrency. An analysis of data from one of the largest NFT marketplaces, OpenSea, shows that the number of collections increased during 2021. At its peak, this marketplace had over 6,000 active collections, with at least one transaction in this period. (Chainalysis, 2022).

2022 starts with a significant decrease in NFT market volume, with the number of sales falling by almost 50% and declining interest from buyers and sellers. At the same time, the volume of trade in USD declines only about 5%. It could relate to growing NFT prices up to 80% starting from Q4 of 2021 and Q1 of 2022. The next reason is that a highly demanded video game asset category hugely circulated during this period (e.g., Axie Infinity). With the affordable prices to buyers, about a hundred dollars an order, it was a significant trading driver but declined to 2022 as the Play to Earth model of the Steam gaming platform. The significant trade volume driver was the speculation with NFT of collectible category or collections of NFT. New collections like CloneX, Azuki, CyberBrokers, etc., keep the market segment growth, and the popularity and hype skyrocket prices.(NonFungible Corporation, 2022a)

There are some marketplaces with different structures of categories or types of NFT assets. The table below (see Table 1) describes popular marketplaces by trade volume, like Binance, or a niche segment's representative marketplace, like NBA Top Shot. The terminology of

marketplaces also has a question about used terms. A marketplace could use a term Category or a term Type with the same meaning. Thus, the paper uses one term Category for both terms to separate NFT with different target auditory, market direction, or technical properties. The table displays a short description of the most used categories and marketplaces selected for this illustration. By exploring the categories on the marketplaces, it was noticed that the NFT market has no agreement or standard in categorizing assets. This conflict leads to very different categorizations between marketplaces where one category can have different names, including other categories or categories with nested tree-like structures with different levels of depth. Moreover, it could be the opposite situation for one marketplace, including category A into B, while another could have B into A. However, the paper analyzes base data on the categories used in NonFungible.com service as the most trustable source (i.e., includes categories Art, Collectible, Game, Metaverse, and Utility).

Tab. 1 – NFTs categories. Source: (Knight, 2021; NonFungible Corporation, 2022b)

<b>Category</b>	<b>Description</b>	<b>Marketplaces</b>
Art	Any art piece (from individual collections or generated by an algorithm) created in a digital form on artistic marketplaces.	Binance, Rarible, SuperRare, Nifty Gateway,
Collectibles, trading cards	A series of digital items is presented by digital images or media, e.g., profile pictures (PFP), and they could be used for other purposes (e.g., video games). Generally, a collectible item is anything with some unique property that can be collected and sold on the market.	OpenSea, Binance, NBA Top Shot, OpenSea, Rarible
Metaverse	Any digital item which could be used in a metaverse. The metaverse is a digital environment that provides human interaction between users and the digital world. It is often associated with virtual reality.	Rarible, NFTworld.io, Decentraland
Gaming	Any digital item for the computer and video game ecosystem. Primarily a game has its ecosystem separated from other games. Video games use NFTs (e.g., weapons or equipment) for gameplay.	Binance, Rarible, ZED RUN, Axie Infinity
Utility	Any digital item that is associated with a real-world asset or right to use, obtain or exchange it. It can include such things as domain names, tickets, etc.	Unstoppable Domains, Rarible, OpenSea
Entertainment	Similar to the utility category, this digital item focuses on real events but not only in the physical world. NFT, as a digital thing, also gives rights as an ordinary ticket to join an event.	Binance
Sports, E-sport	All digital media items focused on historical or memorable events, persons, and similar, in the world of sport and e-sport, e.g., a short video about a single NBA game moment.	Binance
Media (Music, Photography, Memes)	Any digitized photos, music, pictures, texts, or their combinations originated as a physical object or were created in a digital environment.	OpenSea, Rarible Nifty Gateway, AirNFTs, Foundation, Meme, Mintable,

NFT for Good	With this type of digital item, authors try to help a person, non-profits, or NGO organizations collect funds, etc.	Binance
Virtual Fashion	A virtual fashion object has the same role as fashion goods in the real world but is for use in social networks and virtual worlds.	OpenSea, Digitalax, Artisant, Known Origin, DressX, Curate
Real-world assets	One of the primary purposes of this type is to provide cryptographic proof of ownership, access, and further rights to a real asset.	Enjin, Rwanft

### 3 METHODOLOGY

The methodological framework of the paper is based on a systematic content analysis of existing knowledge about Blockchain and NFT technologies obtained from scientific and professional literature, as well as on an analysis of available data on trading with NFTs. Conclusions are formulated based on analytical-synthetic procedures.

The necessary data were obtained from the analytical service NonFungible.com. The service provides data on NFTs on the Ethereum blockchain and shows the most comprehensive view of the NFT market. In July 2022, data series were acquired for the five categories (Art, Collectible, Game, Metaverse, Utility) and the data for the whole NFT market observed by the NonFungible Corporation. It was chosen the daily volume of transactions, the daily numbers of transactions, and the daily average price of the transaction from July 1, 2021, to June 30, 2022, for the research. Transaction volumes and average prices are shown in USD. These metrics present the primary state in NFT markets. There are also used in other studies (e.g., Ante, 2021). It should be noted that on June 10, 2022, NonFungible.com experienced data loss, and at the time of research, the repair process is still ongoing. Due to this event, some data may be updated later.

Data were processed with MS Excel and IBM SPSS Statistics 27 and were examined using descriptive statistics. In the case the data series have extreme values, the data were modified in the way that the extremes were deleted. In the case of outliers, the trimmed mean was calculated, reducing the impact of these values (Rabušić et al., 2019).

### 4 RESULTS

An analysis of the NFT market is carried out as follows: first, NFT categories are described via the structure of trade volume and Number of sales. Next, it shows the distribution of daily pairs "Number of sales" and "Volume of trade" using a scatter plot. These distributions are presented separately for each half-year to identify the differences. After the explorative data analysis is presented, descriptive statistics examines the differences in individual NFT segments.

Accurate classification of tradable digital assets is a very complex task, given the newness of the market and its dynamic development. In addition, as noted by Nadini et al., the properties of a specific object may be such that it will be possible to classify this object into several categories, which complicates the classification process (Nadini et al., 2021). For example, a work of art can also be a collector's item. Another factor is the expansion of NFT into new areas of use. It has not been typical for e-shops to sell digital clothing yet. For now, this sale is rather occasional. However, the possibility of regular trading with other categories of digital goods cannot be completely ruled out in the future.



As part of this research, tradable items on all online marketplaces based on the Ethereum blockchain were analyzed according to data collected by NonFungible Corporation for the period July 2021-June 2022. The NonFungible Corporation divides NFTs into five categories for statistical purposes: Collectible, Metaverse, Game, Art, and Utility.

The structure changes analysis for the number of sales and trade volume between half-years shows some changes for the number of categories where small segments stay small and big ones still stay big enough with some noticed exceptions (see Figure 2). Better to illustrate the noticed changes with specific categories. The growing popularity of Utility NFT is mirrored in the significant growth of sales (from 1.6% to 7%) but small growth in trade (from 0.5% to 1.3%). Art is the most well-known category from the beginning of NFT. The category with the same number of sales demonstrates a significant volume of trade decrease from 13.4% to 3.5%. Partly it could be explained by the growth of trade volume for the Collectible category, which includes part of the Art category NFTs. The most noticeable changes are in the volume of trade structure of the whole market, but the number of sales structure could be described as a rebalancing manner of changes. The changes in the volume of trade structure mirrored new ideas or innovations in the NFT ecosystem. In this case, it could be explained by more considerable interest in and higher NFT prices in these categories. This explanation is possible because the volume of trade and number of sales curves are similar and synchronous, moving in time (see Figure 1).

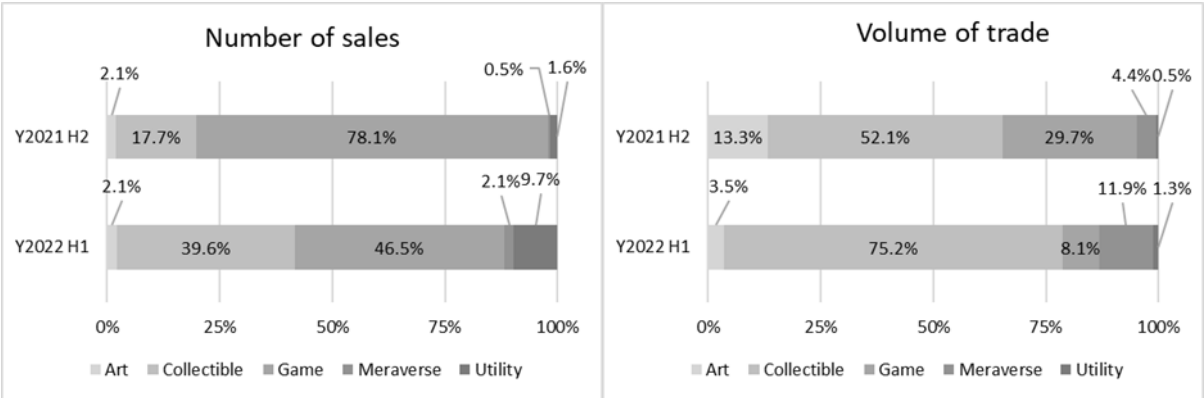


Fig. 2 – Structure of Volume of Trade and Number of Sales in NFT market by segments, July 2021-December 2021 and January 2022-June 2022. Source: own research, NonFungible.com

A scatter plot is used to visualize the distribution of daily values for the volume of all NFT transactions and the number of all NFT sales (see Figure 3). It can be seen that both measures decrease in 2022, and the individual points tend to be placed towards the lower left corner. It can be expected that the number of extremes in the first half of 2022 is relatively lower than in the previous period.

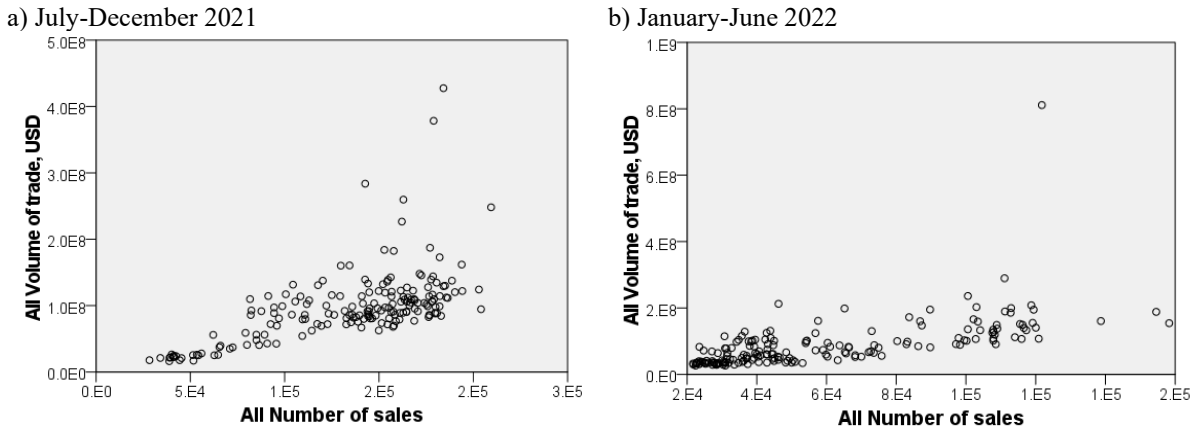
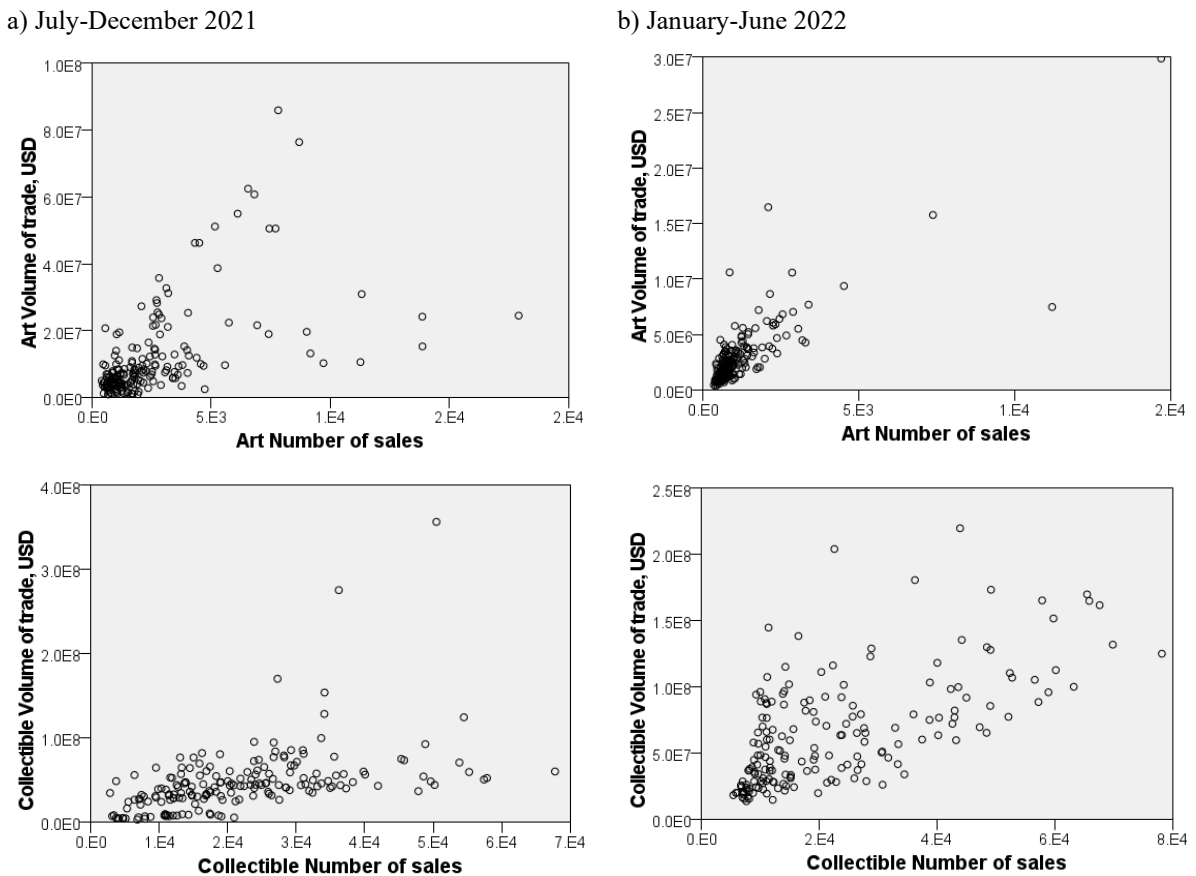


Fig. 3 – Scatter Plots for the All NFTs - pairs Volume of Trade and Number of Sales; a) For the period July 2021-December 2021; b) For the period January 2022 – June 2022. Source: own research, data from NonFungible.com.

The analysis of the distribution of pairs Volume of Trade - Number of sales for individual categories (see Figure 4) shows that the most significant decrease in the distributions of pairs, both value and quantity of trade, was recorded by the Games, Metaverse, and Utility categories. In the Collectible category, we can speak of more significant heterogeneity in the behavior of market participants in 2022, while in the Art category, on the contrary, a transition to a more homogeneous market can be seen.



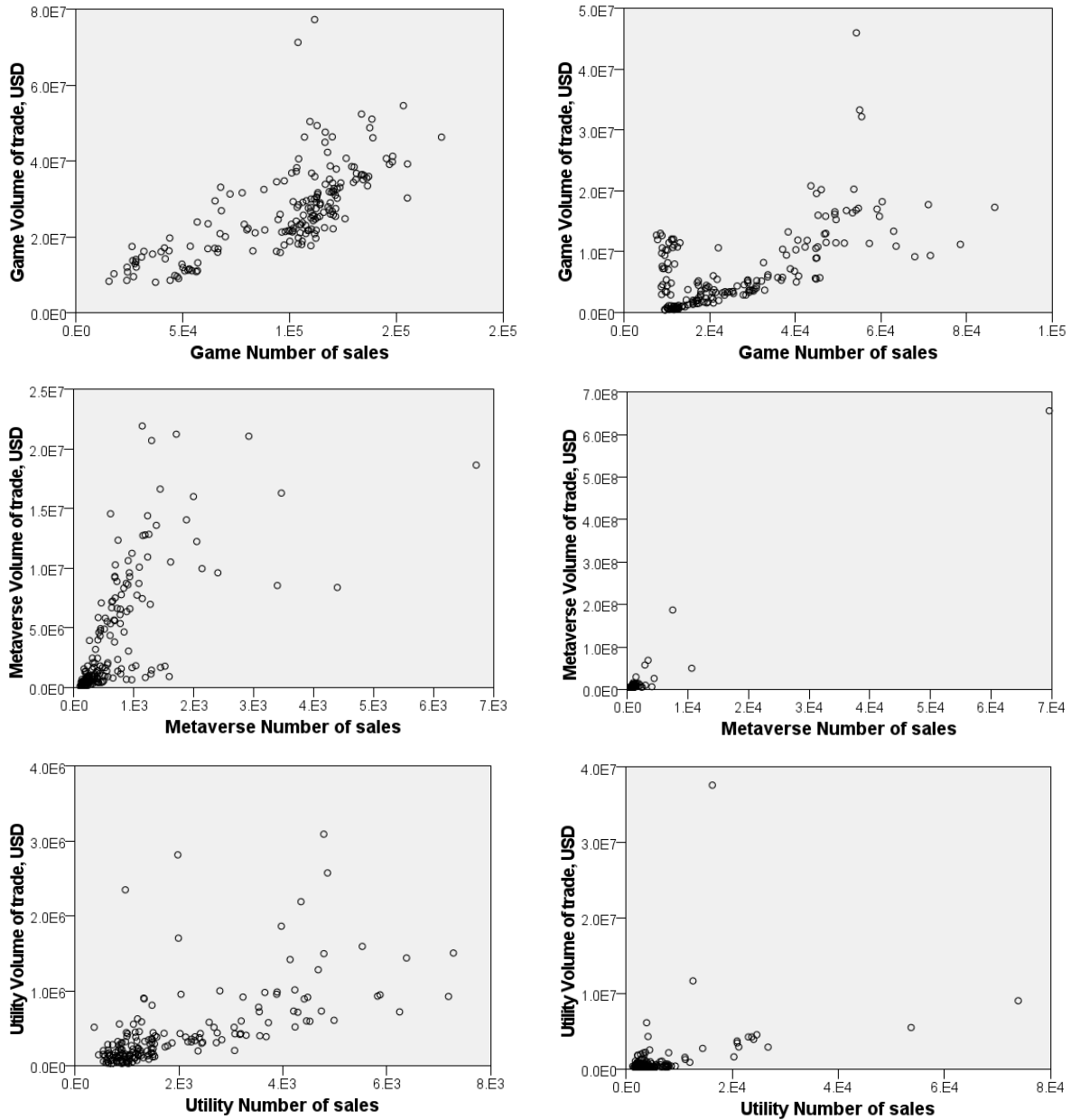


Fig. 4 – Scatter Plots for the segments of NFTs - pairs Volume of Trade and Number of Sales; a) For the period July 2021-December 2021; b) For the period January 2022 – June 2022. Source: own research, data from NonFungible.com.

Further data analysis was performed using descriptive statistics. The average price of an NFT asset calculated based on daily transactions was chosen for the entire NFT market as well as for individual categories. All data were checked for extremes, and extremes were excluded from the analysis to reduce the influence of outliers on descriptive statistics and reduce bias.

Despite the decline in the market in Q1 2022, the average price for the All NFT market increased almost twofold. The average price is calculated as Volume of trade divided by the Number of sales. However, its variability also increased (see below Tab. 2). In the Art segment, the average asset value in 2022 has decreased compared to the previous period. The maximum has also been reduced. At the same time, the coefficient of variation also decreased significantly. It can be concluded that the NFT Art market will stabilize and become less volatile in 2022.

The average prices of NFTs from the Collectible category did not experience such significant changes or declines. On the contrary, the average value increased, and the variability remained at the level of the second half of 2021. In the Game category, a decrease can be seen in both absolute and average values. It can be stated that the average price of a store in this category has significantly decreased. The price variability of those NFTs has increased, which may indicate a considerable heterogeneity of the NFT supply in this market. The NFT category for Metaverse also shows average price growth and reduced variability. Since these are digital assets that can be used by their owners for virtual reality and do not have to be speculative purchases, it can be assumed that the process of determining players and a permanent offer begins in this market. No significant differences between periods in the Utility category can be seen, and this category probably experienced the slightest changes. All categories show a flatter and a right-skewed distribution that means that the majority of observations lie below the mean. It is also confirmed by the median, which is smaller than the mean in all segments.

Tab. 2 – Descriptive statistics on average price in USD of NFT, whole market (All) and the category separately. For the period July 2021-December 2021 and the period January 2022 – June 2022. Source: own research, data from NonFungible.com.

<b>Segments</b>	<b>Descriptive statistics</b>	<b>July-December 2021</b>	<b>January-June 2022</b>
All Segments	Minimum/Maximum	328.87/1,397.06	640.54/3,514.31
	5% Trimmed Mean/ Median	672.09/627.76	1,413.39/1,301.52
	Std. Deviation	210.75	590.96
	Coefficient of Variation	31.3 %	41.8 %
	Skewness/ Kurtosis	1.193/1.045	1.271/1.093
Art	Minimum/Maximum	511.37/18,348.22	668.28/6,031.99
	5% Trimmed Mean/ Median	4,872.77/4,285.15	2,537.42/2,419.01
	Std. Deviation	3,511.89	1,102.77
	Coefficient of Variation	72.0 %	43.4 %
	Skewness/ Kurtosis	1.132/1.332	0.829/0.351
Collectible	Minimum/Maximum	259.67/7,604.87	851.50/10,111.68
	5% Trimmed Mean/ Median	2,144.06/1,969.16	3,208.42/2,752.76
	Std. Deviation	1,348.35	1,974.11
	Coefficient of Variation	62.8 %	61.5 %
	Skewness/ Kurtosis	1.231/1.987	1.364/1.472
Game	Minimum/Maximum	160.68/691.83	40.45/679.76
	5% Trimmed Mean/ Median	282.37/266.61	182.43/154.43
	Std. Deviation	100.71	131.08
	Coefficient of Variation	35.6 %	71.8 %
	Skewness/ Kurtosis	1.529/2.630	1.448/2.190
Metaverse	Minimum/Maximum	584.04/23,701.96	1,642.61/16,102.05

	5% Trimmed Mean/ Median	4,898.07/3,440.32	6,391.98/5,952.75
	Std. Deviation	4,323.23	2,638.08
	Coefficient of Variation	88.2 %	41.3 %
	Skewness/ Kurtosis	1.210/1.334	0.785/0.531
Utility	Minimum/Maximum	30.71/544.51	30.96/480.04
	5% Trimmed Mean/ Median	183.51/161.02	143.96/126.69
	Std. Deviation	112.18	94.41
	Coefficient of Variation	61.1 %	65.6 %
	Skewness/ Kurtosis	1.150/0.986	1.231/1.240

## 5 DISCUSSION

The description of existing NFTs indicates the development of the market. Compared to the second half-year of 2021, the total number of transactions has dropped significantly, and the characteristics of most segments are also changing. It can be assumed that when the market cooled, some participants with speculative behavior left.

The question is whether, in the future, all NFT digital objects will be assets and meet all requirements related to profitability, risk, and liquidity. Alternatively, part of NFTs can be taken more into goods and services due to their nature and participation in consumption.

The year 2021 was announced not only by record sales of digital art objects but also by the entry into this market of companies from the traditional market. In 2022 the video gaming market has decreased transactions with NFTs. The Collectible NFT market looks equally attractive, showing equal interest from participants and investors.

The question is if large international brands see the NFT market as a source of added value. It is interesting that in tourism and cultural institutions, the adaptation of NFT can occur even faster than in the trade of goods. Museums and cultural institutions see the sale of digital copies of cultural heritage objects as an opportunity to improve their financial situation in times of global restrictions due to COVID-19 (Valeonti et al., 2021).

Analysis of average daily transaction prices for individual NFT segments indicates that the increasing variety of values is in the Collectible and Game segments in 2022. Other segments have shown either the same or decreased variation. Most of the NFT object categories' values are below average, which is also consistent with other research which examined an earlier time series (Nadini et al., 2021).

Another research (Nadini et al., 2021) focused on analyzing relationships in the blockchain network between market participants. It was found that traders often form pairs in which both parties have similar power, and 10% of the most powerful trading pairs have the same transaction volume as the other 90% of participants. Another interesting finding was that traders are not completely isolated and often buy NFTs from different categories or collections. The next direction of research would be promising, in which the market of different categories of NFT digital assets could be analyzed to find indications of speculative behavior of investors.

The most critical problem with this research is that the topic of trade with NFT objects is relatively new. At the beginning of scientific research, much information is drawn from professional or popularizing sources, not academic ones. It is also important to mention that using data on NFT transactions, which is freely accessible, has its pitfalls. First, the database

does not contain all individual transactions' data, so the calculations are based on working with sums or average values. Due to the relatively wide range of values of individual transactions, such as Collectible, Art, and Metaverse, this property can distort when forming conclusions. The following significant limitation is using data only from the Ethereum blockchain, leaving other platforms out of the research.

## 6 CONCLUSION

The paper examines the NFTs market during the period of the market growth in the second half-year of 2021 and the market cooling down in the first half-year of 2022. It explores the concept of blockchain technology and the principles of NFT trade. Based on market information, the most significant segments of NFT objects are described, and the characteristic features of each type are presented. Examining the dynamics of the development of transaction volumes and the number of sales is done. Analysis of average NFT prices shows that some segments (e.g., art or games) are affected by a reduction in demand or an outflow of speculative players. The paper indicates the need for a deeper analysis of the behavior of participants in NFT transactions, as well as the dependence of the NFT object market on the movement of the cryptocurrency exchange rate used on blockchain platforms or influence from other asset markets.

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# PERSPECTIVE OF TELEMATICS AT THE SLOVAK INSURANCE MARKET

*Zuzana Gajdošová, Kristína Knoteková*

## **Abstract**

The aim of the article is to evaluate the perspective of telematics insurance at the Slovak market with the help of a questionnaire survey. The questions in the questionnaire survey were set to evaluate the driving behaviour of potential clients, their knowledge, opinion, and interest in telematics insurance. Our target group of respondents were those who hold a driving licence and the two age categories 18-25 years and 26-35 years who represented 83% of the sample. The questionnaire was distributed online on social networks, especially among the social media groups with motor vehicles interest. The questionnaire contained 38 questions, which took approximately 10 minutes to complete. We obtained answers from 450 respondents, out of which 232 were female and 218 were male respondents. The results showed a high ignorance of respondents about the application of telematics in the insurance industry. Despite the drivers' conviction that the evaluation of insurance premiums rate based on telematics is fair, most respondents would not be interested in telematics insurance. That is also thanks to the fact that, there is a very low willingness to share key data with the insurance company when determining the insurance premium rate, such as vehicle position, acceleration, or braking. Not supportive to the development of the telematics in insurance services is the fact of missing standardization about built telematics systems in motor vehicles and telematics used for insurance services at the EU insurance market.

*Keywords: telematics, insurance, SOS Partner*

## **1 INTRODUCTION**

Today, each industry is finding ways how to offer the best quality services to its clients in the most effective way. The insurance industry is not an exception. Insurance companies try to provide, with the help of telematics, the most suitable insurance services, matching the driving skills of their clients. Currently, there is no insurance company operating at the Slovak market that offers telematics insurance for vehicles. The telematics insurance was offered only by Generali Group within a SOS Partner product from 2015 – 2021. However, the Slovak insurance market did not perceive the benefits of the SOS Partner but considered it exclusively as ordinary insurance which was more expensive than the other offered at the Slovak insurance market. Even though there is currently no insurance company at the Slovak market that offers, or plans to launch the telematics insurance, we assume that we can expect such insurance in the later future. The aim of the article is to evaluate the perspective of telematics insurance at Slovak market.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

Telematics technology is an Intelligent Transportation System (ITS). It is the outcome of convergence and subsequent progressive unification of telecommunication technologies and informatics, together with the management economy and mathematical methods of creation and management of omnibus systems (Křivda, 2009). The vehicle's telematics is based on M2M communications and represents the exchange of data between remote devices by means of cable and/or wireless communication network for telemetry and remote control (Husnjak, et al. 2014).

Because different types of telematics equipment that will send the detected data back to insurers are needed for their analysis, this insurance is also known under the names Black Box Insurance, GPS Car Insurance, or Smartbox Insurance. Currently, there are four types of telematics devices used in insurance services: dongles, black boxes, built-in telematics devices, and smartphones. (Dang, 2017)

The introduction of telematics in the insurance sector in several cases in the world have had success. The lead in the use of telematics belongs to the American insurance company Progressive, which introduced PAYD - Pay As You Drive car insurance in 1998. It did so with the help of GPS tracking. However, the telematics pioneer was terminated in 2001 due to the high prices of equipment and information technology costs. Later, in the state of Minnesota, Progressive re-entered the market with a new telematics product that, unlike their previous, did not include GPS tracking of the vehicle but only recorded data on kilometres driven, speed, and time of day when the vehicle is in operation. (Farris, Thompson, 2016)

Another successful example of telematics insurance launched in 2014 is from the company Aioi Nissay Dowa Insurance. The telematics product was aimed at teenage drivers in Japan using the G-book telematics Toyota GPS system, in response to the fact that most young people were losing interest in owning a motor vehicle due to high insurance premiums assessed on their young age and zero previous experience. Toyota Motor Corporation and Aioi Nissay Dowa Insurance are currently still cooperating and innovating the offered services in the field of the telematics insurance for Lexus and Toyota cars. (Yoon, 2008)

Axa Insurance, a global insurance company, used telematics in motor vehicle insurance. This service was aimed at young people aged 18-24 years in Ireland, comparing speed limits with GPS-tracked driving. If the driver exceeded the permitted speed, the alarm alerted him to this fact, and in the case of a later analysis by the insurance company, the price of the insurance premium could increase (Yoon, 2008). Axa Insurance currently offers a motor insurance service for young people without the use of telematics, but in addition to this service, people under the age of 25 can choose to download the DriveSave application to their mobile device, which uses the telematics to additionally adjust their premiums (AXA, 2021).

American Transit Insurance is an American insurance company that represents the leader in providing insurance for taxis in New York. In 2003, the insurance company introduced a program that offered a premium discount for taxis using IBM e-Drive. This program did not cause privacy problems, as the data from the black box was sent to the insurance company only after the vehicle crashes. (Vartanian, 2003)

At the Slovak insurance market, the telematics insurance has been offered only by Generali Group (Generali) till now. Generali launched the telematics insurance in 2015 and continued with its selling till 2021. The telematics insurance could be purchased for Accident Insurance (AI) or for a combination of Compulsory Motor Third-Party Liability Insurance (CMLI) and AI for vehicles weighing up to 3.5 tons. The vehicle could not be older than 12 years and had to be used only for private purposes. With the purchase of the telematics insurance, a telematics device was installed free of charge in the cab on the windscreen of the vehicle in the authorized service. The telematics device was then rented by the client from Generali during the whole insurance period. After the end of the insurance contract, the client had to return the telematics device to Generali. The telematics device used by Generali had the built-in SIM card, speaker, and microphone. In case of an accident or a collision with an overload of more than 2.5 G, the telematics device automatically brought this to the attention of the assistance service. The assistance service tried to connect with the vehicle crew by using a telematics device. Based on the detected information, the assistance service sent the necessary assistance to the place of the vehicle accident. The assistance services were valid only if the accident occurred on the territory

of Slovakia or Czech Republic. The telematics device could also be used by the driver in the event of a failure of the vehicle, when he could contact the assistance service by pressing the button on the telematics device, which provided him with necessary service assistance, such as towing a non-mobile car or refuelling. The territorial validity of the assistance service was also in the countries of negotiated insurance and in countries such as Albania, Serbia, and Romania. By purchasing the SOS Partner from Generali, the client automatically received a discount of 5% from the premium rate of AI and a discount of 10% from the premium rate of CMLI. He also gained access to the so called "Quality Driver" portal from Generali, where the data obtained from the telematic equipment were evaluated – mileage, type of roads, average time spent on the roads and using complex algorithms, the client's level of prudence, level of risk and level of attention were also determined. If the driver fulfilled the required parameters, he received for the next insurance period a discount of 10% from the premium rate of AI and a discount of 20% from the premium rate of CMLI. (Generali, 2022)

However, the Slovak insurance market did not perceive the benefits of the Generali SOS Partner product. Slovak clients considered it exclusively as ordinary vehicle insurance which was more expensive than the other offered at the Slovak insurance market. Even though there is currently no insurance company at the Slovak market that offers, or plan to launch the telematics insurance, we assume that we can expect such insurance in the later future. The current expectation is that by 2024, the possibility of vehicle insurance together with telematics services will be the standard at the world level and that clients will choose whether they want such insurance or not (Finnegan, Sirota, 2004). The potential of telematics in the field of motor vehicle insurance is huge, but the ways to use it can be different. Currently, there is general agreement that there are no obstacles from a technological point of view, the problem is standardization, harmonization, and the willingness to find and implement unified approaches that would bring the mentioned benefits to all parties involved (Janota, 2015).

### **3 METHODOLOGY**

The aim of the article is to evaluate the perspective of telematics insurance at Slovak market. For the analysis purposes the questionnaire in Microsoft Forms was used. The main goal of the questionnaire was to evaluate the driving behaviour of potential clients, their knowledge, opinion, and interest in the telematics insurance. Our target group of respondents were those who hold driving a licence. The questionnaire was distributed online on social networks, especially among the social media groups with motor vehicles interest. The questionnaire contained 38 questions, which took approximately 10 minutes to complete. We obtained answers from 450 respondents, out of which 232 were female and 218 were male respondents. We received answers from each defined age category, but the largest representation of answers was from respondents in the age category 18-25 years (300). Together with the following age category 26-35 years, our respondents made up 83% of our sample. Since there is currently no insurance company at the Slovak market that offers, or plans to launch the telematics insurance, we assume that we can expect such insurance in the later future. Based on this fact, we focused on the answers of the respondents of the 2 youngest age categories, people aged 18-25 and 26-35 years. Besides that, several studies have proved, that young people are more open to technological innovations, so they could be more interested in this type of insurance (Vogels, 2019). The age categories and percentage of driving license holders among the respondents are shown in Table 1.

Tab. 1 - Age categories and driving license of respondents

	Age category				Driving license			
	n	N	f	F	Yes		No	
					n	f	n	f
<b>18 - 25 year</b>	300	300	67%	67%	274	60.89 %	26	5.78 %
<b>26 – 35 years</b>	72	372	16%	83%	70	15.56 %	2	0.44 %
<b>36 – 50 years</b>	51	423	11%	94%	51	11.33 %	0	0 %
<b>51 – 65 years</b>	21	444	5%	99%	21	4.66 %	0	0 %
<b>66 year and more</b>	6	450	1%	100%	3	0.67 %	3	0.67 %
<b>Sum</b>	<b>450</b>	<b>-</b>	<b>100%</b>	<b>-</b>	<b>419</b>	<b>93.11 %</b>	<b>31</b>	<b>6.89 %</b>

The economic status of our respondents is also closely related to the age structure, where each respondent had to indicate whether he/she is a student, employed, unemployed, freelancer, retired, or on maternity/parental leave. When looking at the age structure in Table 2, it is understandable that students are the most represented with the number of 245 and employed with the number of 154. We perceive this fact positively, as opinions of younger generation are the most relevant for us in terms of the use and future perspective of telematics in the insurance industry at the Slovak market.

Tab. 2 - Economic status of the respondents

Economic status	n	f
<b>Student</b>	245	54.4%
<b>Employed</b>	154	34.2 %
<b>Freelancer</b>	20	4.4%
<b>Retired</b>	14	3.1%
<b>Maternity/parental leave</b>	10	2.2%
<b>Unemployed</b>	7	1.6%
<b>Sum</b>	450	100%

The various opinions of the respondents on the issue of telematics in the insurance industry can also be influenced by the level of education. Therefore, we decided to characterize our respondents according to this factor as well. We had the largest percentage representation 60% of respondents with completed secondary education with a high school diploma, 36% of respondents with completed university education, and the smallest representation of respondents with primary, or secondary education without a high school diploma.

Tab. 3 - Respondents according to their highest completed education

The highest completed education	n	f
<b>Elementary</b>	6	1.3%
<b>Secondary education without a high school diploma</b>	10	2.2%
<b>Secondary education with a high school diploma</b>	270	60%
<b>Batchelor degree</b>	76	16.9%
<b>Master's degree</b>	81	18%
<b>PhD degree</b>	7	1.6%
<b>Sum</b>	450	100%

In terms of place of residence, 60% of our respondents live in the city, the remaining 40% live in the countryside. Respondents living in the Bratislava region had the highest percentage representation 45.3%. Since the other regions had a low percentage representation in terms of the number of respondents, this fact indicates that our qualitative survey has an informative value especially for the Bratislava region.

## 4 RESULTS

Based on our results, out of 450 respondents more than 93% had a driving license for a motor vehicle (drivers) and 60% of respondents own a car. More than 78% of drivers drive at least once a week or more. Thus, most of our respondents were active drivers. More than 58% of drivers have never been fined. 22% of respondents have been fined only a few times, and 19% of respondents have received a fine only once so far. Thus, most of our respondents with driving licence can be characterized as responsible drivers who follow the regulations. The age of the owned motor vehicle is one of the main preconditions for buying a telematics insurance. The age of motor vehicles owned by respondents is shown in the Table 4.

Tab. 4 - Age of motor vehicles owned by respondents

Age category Age of car	18 – 25 years	26 – 35 years	36 – 50 years	51 – 65 years	66 and more	Sum	
	n	n	n	n	n	n	f
0 – 3 years	15	12	14	3	2	46	17.23%
4 - 6 years	13	18	11	2	0	44	16.48%
7 – 10 years	30	9	9	2	1	51	19.1%
11 and more	80	22	13	11	0	126	47.19%
Sum	138	61	47	18	3	267	100%

Almost half of the motor vehicles of respondents is older than 11 years. Based on this fact we can say that the vehicles are very worn, and their current value is very low compared to their original value. Our results are in line with data from the Association of European Vehicle Manufacturers (ACEA), based on which the average age of passenger vehicles registered in Slovakia was 14 years in 2020 (ACEA, 2022).

Out of 60% of respondents who own a car, only two did not have a CMLI. As could be seen in table 5 the annual premium rate of CMLI of respondents was in the range of €101 - €150 and it was the most common for all age categories of respondents. According to our results, the annual premium rate of CMLI was not higher than €200 for more than 83% of respondents who had a CMLI.

Tab. 5 - The annual CMLI premium rate

Age category Premium rate	18 – 25 years	26 – 35 years	36 – 50 years	51 – 65 years	66 and more years	Sum	
	n	n	n	n	n	n	f
Up to 100 €	26	10	10	5	0	51	19.24%
101 € - 150 €	45	27	27	7	0	106	40%
151 € - 200 €	37	18	3	4	2	64	24.15%
201 € - 250 €	18	4	4	2	0	28	10.57%
251€ - 300 €	5	1	2	0	0	8	3.02%
301 € - 350 €	2	0	1	0	0	3	1.13%
351 € and more	4	0	0	0	1	5	1.89%
Sum	137	60	47	18	3	265	100%

Since we consider the telematics as a new term that is not commonly used within the Slovak society our respondents were asked whether they have already heard about insurance services using telematics. Our results showed a large disparity, where only 16.47% of all drivers

encountered the term telematics in connection with the insurance industry. Even though the expectation of awareness of younger respondents about insurance services using the telematics were more positive, in the two youngest age categories, a high level of ignorance about the possibility of telematics insurance prevailed (70%).

Tab. 6 - Drivers' awareness of insurance services using telematics

Age category	Knowledge of insurance services using telematics		Yes		No	
	n	f	n	f	n	f
18 – 25 years	44	10.50%	230	54.89%		
26 – 35 years	9	2.15%	61	14.55%		
36 – 50 years	11	2.63%	40	9.55%		
51 – 65 years	4	0.95%	17	4.06%		
66 and more	1	0.24%	2	0.48%		
<b>Sum</b>	<b>69</b>	<b>16.47%</b>	<b>350</b>	<b>83.53%</b>		

Most drivers who already knew about the usage of telematics in the insurance services learnt about it from the internet, family, and friends. Contrary, the fewest people learned about telematics through newspapers and magazines.

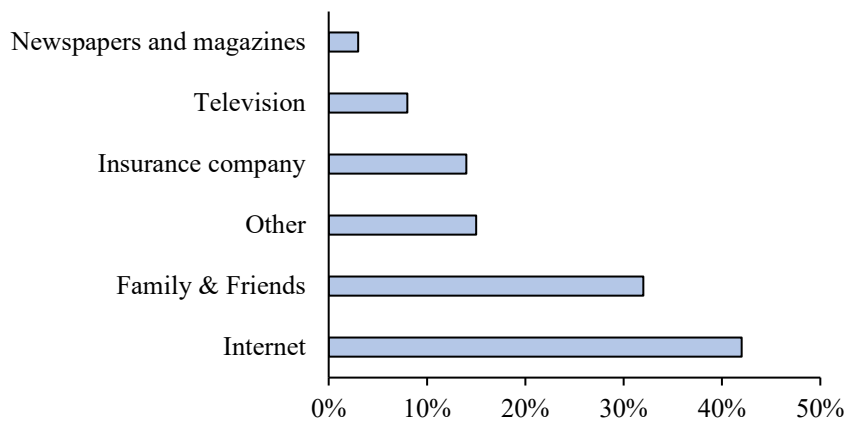


Fig. 1 – Information sources for drivers about telematics used for insurance services. Source: own research

Because the telematics insurance is based on the determination of the insurance premium rate based on the driving style of the insured, the respondents were asked whether they consider it fair to determine the insurance premium rate based on the driving style of the insured (Table 7).

Tab. 7 - Opinion on the calculation of insurance premiums based on telematics data

Age category	Telematics is fair		Yes		No	
	n	f	n	f	n	f
18 – 25 years	211	50.36%	63	15.03%		
26 – 35 years	46	10.98%	24	5.73%		
36 – 50 years	36	8.59%	15	3.58%		
51 – 65 years	18	4.30%	3	0.71%		
66 and more	2	0.48%	1	0.24%		
<b>Sum</b>	<b>313</b>	<b>74.71%</b>	<b>106</b>	<b>25.29%</b>		

From the obtained results we can see, that in every single age category, the opinion that considers it fair to set the price of the CMLI insurance based on the driver's driving behaviour significantly prevailed. For respondents who do not consider the usage of telematics in the insurance industry to be fair, the three main arguments were stated. The most frequent argument was that the driver often does not influence what is happening in road traffic, and to avoid a traffic accident, it is often necessary to brake sharply or, on the contrary, accelerate (36.79% of respondents). The respondents also pointed to the fact that a driver who drives according to the regulations does not have to be immediately classified as safe, the driver does not have to be attentive, he can use a mobile phone while driving and vice versa, a driver who drives faster can be more experienced, can better anticipate situations and thanks to that react more promptly. The 6.6% of respondents also disagreed with the collection of personal data. They consider the telematics to be a disruption of privacy and fear misuse of this information. A minor number of respondents (4.72%) referred to telematics as a tool with which the insurance company tries to increase premium rates, as they consider obtaining a discount using calculations to be difficult to achieve. Followingly, the respondents were asked whether they would be interested in buying such a telematic vehicle insurance.

Tab. 8 - Interest of drivers in the telematics insurance

Age structure \ Interest in telematics insurance	Yes		No	
	n	f	n	f
18 – 25 years	103	24.58%	171	40.81%
26 – 35 years	23	5.49%	47	11.22%
36 – 50 years	15	3.58%	36	8.59%
51 – 65 years	8	1.91%	13	3.10%
66 and more	1	0.24%	2	0.48%
Sum	150	35.80%	269	64.2%

The pricing of insurance premiums based on telematics is considered fair by 74.71% of all respondents holding a driver's license, but not even half of them would be interested in the telematics insurance. The respondents who would buy telematics insurance (67%) were asked another question and that was what kind of data they would allow the insurance companies to collect, and for which type of telematics device would they be interested in as a client.

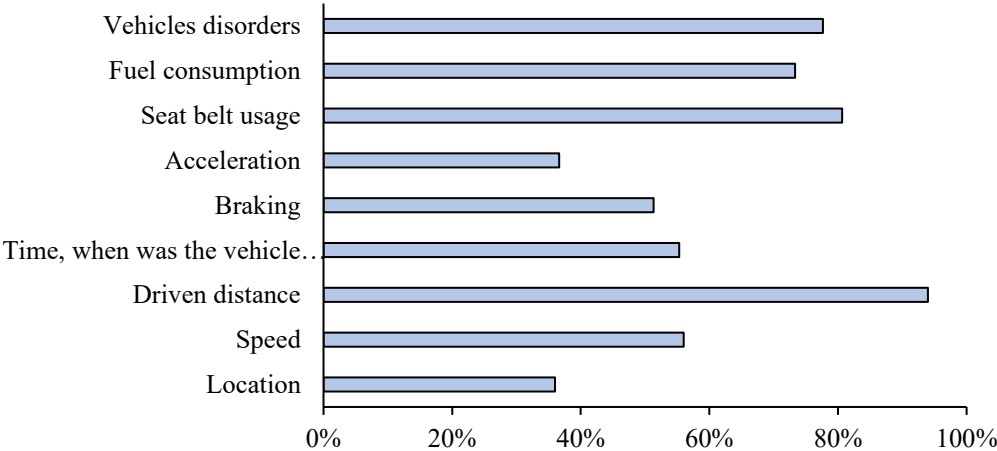


Fig. 2 – Preferences of collected data of those interested in telematics insurance. Source: own research

Respondents who are interested in the telematics insurance are willing to share with insurance company data on distance travelled, seat belt use, and fuel consumption. Contrary, drivers who would be interested in telematics insurance agreed at least to share information about the position, acceleration, and braking of the vehicle.

Tab. 9 - Telematics device type preferences

Age structure \ Type of telematics device	Application in smartphone		Installed telematics device in car		Not important	
	n	f	n	f	n	f
18 – 25 years	57	38%	25	16.67%	21	14%
26 – 35 years	15	10%	5	3.33%	3	2%
36 – 50 years	5	3.33%	8	5.33%	2	1.33%
51 – 65 years	1	0.67%	6	4%	1	0.67%
66 and more	1	0.67%	-	-	-	-
<b>Sum</b>	<b>79</b>	<b>52.67%</b>	<b>44</b>	<b>29.33%</b>	<b>27</b>	<b>18%</b>

To collect the necessary data for calculating the insurance premium rate, the two youngest age groups (48%) preferred the usage of the application in a smartphone (53% of all respondents). This fact represents an advantage for insurance companies because such a collection method is less expensive than a telematics device installed directly in the vehicle which was preferred by 29% of respondents.

Finally, the last two questions were dedicated to the SOS Partner product from Generali. Based on the results of the given questions, we can say that only 5% out of all drivers (419) knew about this telematics insurance. Of these, only 1 driver, a man in the age category 18-25, had purchased this product. The respondent stated that the discount provided by SOS Partner was not enough to motivate him to drive the vehicle more prudently. He also stated that he did not perceive any other benefits of this insurance and that there was a minimal difference in price compared to other classic insurance. In the case there would be another possibility to buy the telematics insurance again the respondent would not buy it again.

## 5 DISCUSSION

Currently, there is no insurance company operating at the Slovak insurance market that offers telematics insurance for motor vehicles. In the past, telematics insurance was provided only by Generali insurance company within the product SOS Partner. An interesting fact is that even though there is a high homogeneity of insurance services among the insurance products of different insurers at the Slovak insurance market, no other insurance company has decided to provide telematics insurance in the 6 years of SOS Partner's operation. Several factors are behind this fact, such as the high cost of telematics, insufficient demand from clients, or fear of reputational risk for the insurance company in the case of its failure. One of the main findings from the questionnaire research is the fact that Slovak insurance clients lack information about telematics and the usage of telematics in the insurance industry. Another finding is that many drivers consider it fair to set the price of the insurance premium rate based on the way they drive. Despite this, there is a high aversion to purchasing the telematics insurance. Even among the small number of drivers who would be interested in buying such insurance, there is a very low willingness to share a key data with an insurance company (13.33%) when determining the insurance premium rate, such as vehicle position, acceleration, or braking. As Yao (2018) reported, this reluctance likely stems from concerns about the misuse of sensitive information.



All these findings represent unfavourable prospects for the application of telematics in the insurance industry in Slovakia. The success of the telematics insurance in other countries could be caused by a larger insurance market, where there is higher competition between insurance companies, and by a larger number of clients, thanks to which insurance companies can more efficiently cover the cost of telematics services. On the contrary, the premium rates for the Compulsory Motor Third-Party Liability Insurance and Accident Insurance are very low in Slovakia in comparison with the countries where the telematics insurance is successful. Therefore, for the successful implementation of telematics at the Slovak insurance market, an increase in the premium rates is needed. Otherwise, a low discount on telematics insurance does not motivate for buying as well as providing the telematics insurance. Slovak insurance companies could be also inspired by other countries in the implementation and successful selling of the telematics insurance. Especially from other EU countries where the insurance market is similar to the Slovak one. A positive example could be the Czech insurance company UNIQA which actively sells the telematics insurance SafeLine nowadays (UNIQA, 2022).

There is also a need to raise awareness of telematics used in the insurance services among potential clients, especially among young people. Since the young people have higher premium rates due to their young age, the telematics insurance should be the most reasonable especially for them. The premium rate could be in this case lowered based on their satisfactory driving style. The clients should be also ensured that the collected data from the telematics device will not be misused. A positive example could be the SOS Partner product from Generali, where the collected data were sent to the server of Generali Italy and were used in the case of collision and for the premium rate calculation only.

The current expectation is that by 2024, the possibility of vehicle insurance together with the telematics services will be the standard at the world level (Finnegan, Sirota, 2004). The implementation of EU legislation of a mandatory telematics systems for the motor vehicles could solve the current problem of standardization and harmonization of telematics in the European insurance services. Such a legislation would support the development of telematics in EU as well as at the Slovak insurance market.

## **6 CONCLUSION**

Today's modern era is marked by significant and rapid technological advances, which insurance companies are also trying to use. To provide quality insurance services, relevant data about the clients are needed. In the field of motor vehicle insurance, telematics, which determines the insurance premium rate based on the driver's driving skills and style, can help to have such data. The aim of the article was to evaluate the perspective of telematics insurance at Slovak market with the help of a questionnaire survey. The questions in the questionnaire survey were set to evaluate the driving behaviour of potential clients, their knowledge, opinion, and interest in the telematics insurance. The results showed a high ignorance of respondents about the application of telematics in the insurance industry. Despite the drivers' conviction that the evaluation of insurance premiums rate based on telematics is fair, most respondents would not be interested in the telematics insurance. That is also thanks to the fact that, there is a very low willingness to share key data with the insurance company when determining the insurance premium rate, such as vehicle position, acceleration, or braking. All these findings represent unfavourable prospects for the application of telematics in the insurance industry in Slovakia. The Slovak insurance companies could be inspired by other countries in the implementation and successful selling of telematics insurance. Another negative fact is the missing standardization of built telematics systems in motor vehicles and telematics used for insurance services at the EU insurance market. The implementation of an EU legislation of a mandatory telematics system

for the motor vehicles in the future, such as the eCall system, would support the development of telematics at the EU as well as at the Slovak insurance market.

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# IMPACT OF FOREIGN DIRECT INVESTMENT IN THE SERVICES SECTOR ON THE ECONOMIC GROWTH OF THE COUNTRY

*Dagmar Grachová*

## **Abstract**

For countries at any level of economic development, foreign direct investment is crucial as an engine of economic expansion. With the EU countries, where a lot of direct foreign investments move every year, this is not the case. These are distributed throughout several economic sectors of the target nation. The service sector, where a significant amount of foreign direct investments are directed each year, plays a significant role in this direction and, as a result, contributes significantly to the expansion of these countries' GDP. The establishment of Centers of Shared Services in the host nation is a significant component of foreign direct investment in the services sector. By exporting the services they provide to their parent, sister, or other businesses in other countries throughout the world, these centers help to create GDP. The article's goal is to investigate the relationship between FDI into the services sector, overall service exports, and service exports in the area of information and communication technologies, and the dependent variable GDP per capita as an indicator of the country's economic development. The paper makes use of several scientific research techniques. The process used to process the theoretical portion of the paper was the collection and processing of theoretical literary sources. The use of quantitative tools, specifically linear regression, which examines the relationship between chosen variables, serves as the foundation for processing the empirical portion of the piece. On the basis of theoretical literature sources, assumptions about dependencies could not always be verified. Our research confirmed the correlation between service sector FDI and GDP per capita. In this instance, FDI has a negative effect on economic growth. In contrast, a positive correlation was observed between the export of services in the field of information and communication technologies and the country's economic growth. The discussion section provides theoretical support for the findings.

**Keywords:** *foreign direct investment, shared service centers, economic growth*

## **1 INTRODUCTION**

Every year, countries around the world strive to achieve economic growth, which is directly related to the improvement of the population's standard of life. Foreign direct investment (FDI), which flows to the country from other countries, is a major factor that considerably contributes to the country's economic growth, however, FDI may not always have a positive impact on the economy of the host nation. (Ivanová, 2013). The economy of the target nation's various sectors receives these investments. Services are a significant industry to which FDI is targeted. The country's Gross domestic product (GDP) is subsequently created using data from this sector (Euroekonóm, 2019).

The outlook for the country's added value creation, further advancement, and continued economic expansion is being rebuilt as FDI flows into the service sector. FDI enters several sectors with services. Shared Service Centers (SSCs) are autonomous organizations that provide one or more services for their parent company, sister company, or other organization more effectively than if the specified activities were performed by the organization itself (Brühl, Richter, 2016). SARIO (2018) states that SSCs either carry out particular outsourced business activities for third parties from abroad or provide international support services for their parent company and other subsidiaries.

Based on extensive market research and the specific country's economic situation, large international firms locate SSCs in numerous countries. Gaining access to SSCs developed in a particular nation is advantageous for huge global firms. The countries that could host these centers want to draw multinational firms in order to foster the kinds of business environments that will help them compete with other countries (Urbaníková, 2017). The benefits of FDI in the form of SSCs are numerous. These advantages align with the advantages listed in the theoretical background section below Youtzov (2020), Topuz and Sekmen (2019), Rustamugli and Baxodirovna (2021).

Marciniak (2019) outlined a number of factors that can be used to pinpoint the justifications for the nation's SSC construction. These factors include: availability of a skilled and affordable labor force, linguistic diversity among countries, geographic location, time zone, cultural homogeneity, political climate, tax structure, and others. The stated reasons for SSC admission also provide as justifications for FDI influx into these countries, which raises the level of the respective economies' economies overall.

The authors examine the issue of FDI from various perspectives and monitor numerous factors. There are varying outcomes as a result of their use of distinct research methodologies. Using quantitative methods, this article focuses on the debated issue of FDI and its impact on the economic growth of countries.

The article is divided into several sections. The theoretical section of the article contains fundamental information about FDI. In the methodology section, we describe the formulas and procedures used in the article's empirical section. In the following section - results - we confirm / reject the hypotheses regarding the relationship between the dependent variable and the independent variables. In the discussion, we explain the rationale behind our research results and their limitations.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

One of the fundamental macroeconomic factors that has a big impact on a country's economic growth is FDI. For countries' development strategies, examining the causal link between FDI and economic growth provides key outputs. (2014) Nistor It is significant to distinguish between countries in this context based on their levels of development. Here, we differentiate:

- least developed countries;
- developed countries;
- developing countries.

According to Nistor (2014), FDI is very important for rich countries and contributes significantly to the economic progress of underdeveloped countries. The literature is divided on the relationship between capital flow and economic growth's causality. There are three distinct groupings of viewpoints (Topuz and Sekmen, 2019):

1. studies that suggest that the relationship between capital flow and economic growth is positive in line with theoretical expectations,
2. the relationship between capital flow and economic growth may differ according to the data set or method used in the study,
3. no generally accepted positive relationship between the two macroeconomic variables and in some cases it is emphasized that capital inflows may negatively affect economic growth.

The most crucial elements that must be considered while analyzing FDI and economic growth are listed by Yotzov (2020). These include factors like the size of the economy, human capital, economic freedom, financial system development, labor costs, taxation, institutional quality, trading style, and economic dangers.

FDI has a variety of beneficial and negative consequences on the host nation. The development of new jobs and the ensuing decrease in unemployment in the nation, the growth of household incomes, the improvement of people's quality of life, and the overall higher economic growth of the given country are identified by Rustamugli and Baxodirovna (2021) as positive factors.

Youtzov (2020) listed the nation's technical advancement, labor force training, management expertise, and other factors as favorable effects. Topuz and Sekmen (2019) assert that the influx of capital causes the financial markets to integrate, develop, and deepen. With more lucrative investment opportunities and greater profit rates, emerging countries are more likely to experience these benefits of capital flows. Along with the positive benefits, the author also lists a number of negative ones, such as market distortion (aggressive FDI policy) and the crowding out of domestic investments by the diversion of limited resources from other productive sectors.

Zhang (2006) divides the impact of FDI on economic growth into four basic categories:

- increased capital accumulation and employment,
- encourages manufactured exports,
- management knowledge, know-how, the qualified labour force in the international production network and branding,
- technology transfer and spillover effects.

### **3 METHODOLOGY**

The article uses a number of scientific research techniques. The collection, analysis, and comparison of theoretical sources of literature addressing the topic under investigation served as the foundation for processing the first, theoretical section of the paper. Here, we draw from the writings of scholars who study FDI and how it affects a nation's economic development. We analyze these writers' claims utilizing the method of analysis, and then we compare and synthesize the key details pertaining to the problem we are looking into. We consider the aforementioned techniques to be the most suitable for formulating the article's starting points. On the basis of the survey and subsequent comparison of the available literature, it was possible to formulate hypotheses and select the method utilized in the article's empirical section.

In the article's empirical section, we use quantitative analysis of a few chosen indicators. Our research aims to determine whether there is a correlation between the dependent variable, defined as GDP per capita, and a few independent factors, including FDI into the service sector, general service exports, and exports of services related to information and communication technology. Authors who address the topic of SSCs employ quantitative analysis, but their research focuses on a different aspect of this field, e.g. Šindelář, Janasová, (2020) on SSCs in the Czech Republic, Subhan, Alharth, Alam, Thoudam, Khan (2021) on India, etc.

In the theories, one can also find differing author perspectives on the effect of FDI on economic growth (Hlavacek, Bal-Domanska, 2016; Albuлесcu, 2015). As a result, we decided to employ a quantitative approach to examine the divergent viewpoints, while focusing specifically on the investigated topic - SSCs within the context of FDI.

Subhan, Alharth, Alam, Thoudam, Khan (2021), and Chauhan (2020) examined the relationship between the gross domestic product and exports. They focused their research on countries

including India, China, Japan, Germany, and others. Their research reveals both positive and negative relationships between GDP and exports. In our article, we chose to proceed within the context of SSCs and to concentrate our research on the service sector, which SSCs can be categorized within.

With the exception of those that did not disclose any of the analyzed data throughout the monitored period, which was the year 2019, the statistical sample consisted of 22 countries from the European Union.

Through the OLS model, which may be described as follows (Koop, 2008), we are able to determine the dependence.

$$\begin{aligned}
 y_t &= \beta_0 + \beta_1 X_t + u_t \\
 &- 0,3557 + 26521,8 \\
 &0,05338 + 26521,8 \\
 &0,46887 + 26521,8
 \end{aligned}
 \tag{1}$$

In this regard, it should be mentioned that the study countries lack a standard reporting mechanism for SSC activities. As a result, it is impossible to define clearly service-related activities or the export of only services from SSCs. We used information on services that were exported in the area of information and communication technologies to process this article. A review of the theoretical sources in the literature reveals that these centers engaged in a variety of activities, with this group housing the majority of them.

In the discussion section, we provide justification for the results obtained using the GDP p. c. or GDP calculation formula. We chose to apply the formula for estimating GDP using the pension method (Lysý, 2016) in order to process this article:

$$\text{GDP} = C + I + G + X
 \tag{2}$$

Whereas:

- (C) household consumption expenditure
- (I) private gross domestic investment
- (G) state expenditure on the purchase of goods and services
- (X) net export (= export – import)

Both theoretical and statistical sources are used to support the essay. The works of writers listed in the Web of Science or SCOPUS databases are examples of theoretical sources of literature. All of the databases of institutions from which the statistical data were gathered are included in the literature review at the end of the article. A graph and a table that display the observed facts help to ensure the transparency of the statistical data.

## 4 RESULTS

In industrialized countries, the expansion of the service industry is crucial. They generally exhibit high added value, which is represented in the GDP and speaks to the level of economic development in the respective nation. The next section of the article focuses specifically on the service sector, FDI entering this sector in the countries under observation, and the export of these services. Particular attention is given to the export of information technology services,

such as those offered by SSCs to parents, sisters, and other businesses around the world. These hubs account for a sizeable portion of FDI input.

#### 4.1 Services as a key factor of economic growth

In the following section of the article, we will look at the relationship between the fundamental economic indicator (GDP p. c.), and a few indicators in the services sector.

H0 (a): There is no relationship between GDP p. c. growth and FDI inflows into the service sector, whereas in our model, the relationship was evident.

H0 (b): There is no relationship between GDP p. c. growth and exports of services in general, despite the fact that this relationship appeared in our model.

H0 (c): There is no relationship between GDP p. c. and the export of services related to information and communication technology, despite the fact that this relationship appeared in our model.

Tab. 1 - OLS MODEL. Source: own research

Model 1: OLS, using observations 1-22				
Dependent variable: GDP p.c. 2019				
	coefficient	std. error	t-ratio	p-value
const	26521.8	4322.74	6.135	8.55e-06 ***
FDI in services	-0.355774	0.0706621	-5.035	8.61e-05 ***
Total services export	0.0533855	0.0375556	1.422	0.1723
ICT services export	0.468877	0.152102	3.083	0.0064 ***
Mean dependent var	38499.78	S.D. dependent var	23064.06	
Sum squared resid	3.66e+09	S.E. of regression	14253.88	
R-squared	0.672623	Adjusted R-squared	0.618060	
F(3, 18)	12.32750	P-value(F)	0.000128	
Log-likelihood	-239.4345	Akaike criterion	486.8691	
Schwarz criterion	491.2332	Hannan-Quinn	487.8971	

At the level of 0.6726, the value of r-squared falls within the range of values that go from 0 to 1. It is reasonable to infer that there is some kind of connection between the variables on the basis of the value that has been provided, and the model does a good job of explaining the connections that exist between the variables. The model can be considered statistically significant given the results of the F-test, which were reported as  $p\text{-value}(F) = 0.000128$ , respectively.

(a) We reject H0 based on the investigation's findings:  $8.61e-05 < 0.05$  (a). The GDP p. c. increases by 0.3557 when FDI into the service sector increases by one unit.

(b) Given the investigation's findings:  $0.17 > 0.05$  H0 (b) cannot be disproved or rejected. The GDP p. c. increased by 0.0533 with a one-unit increase in service exports.

(c) Based on the investigation's findings:  $0.0064 < 0.05$ , we reject H0 (c). The GDP p. c. has increased by 0.4688 due to the expansion of the export of services related to information and communication technologies.



Tab. 2 - Multicollinearity. Source: own research

Values > 10,0 may indicate a collinearity problem	
FDI in services	1,235
Total services export	1,536
ICT services export	1,821
No evidence of collinearity existence.	

Therefore, the model does not contain any collinearity between the variables that are considered to be independent.

Using the Breusch-Pagan test, which is summarized in the table that follows, we examine whether or not the model satisfies the requirement of homoscedasticity.

Tab. 3 - Breusch-Pagan test for heteroskedasticity. Source: own research

OLS, using observations 1-22				
Dependent variable: scaled uhat <sup>2</sup>				
	coefficient	coefficient	t-ratio	p-value
const	0.662983	0.397756	1.667	0.1129
FDI in services	-1.29358e-05	6.50195e-06	-1.990	0.0621 *
Total services export	3.42686e-06	3.45567e-06	0.9917	0.3345
ICT services export	1.06406e-07	1.39956e-05	0.007603	0.9940
Explained sum of squares = 9.36666				
Test statistic: LM = 4.683332, with p-value = P(Chi-square(3) > 4.683332) = 0.196509				

H0: Heteroskedasticity is not present.

Given that the p-value for the model is equal to 0.196509, the null hypothesis H0 cannot be accepted, but it also cannot be rejected. On the basis of the findings, it is reasonable to conclude that our model contains elements of heteroskedasticity. This indicates that the model is not consistent, but it does mean that it is unbiased. In this particular scenario, the use of confidence intervals and additional testing of hypotheses would be inappropriate (KOOP, 2008).

## 5 DISCUSSION

Dependent variable the GDP p. c., which provides information on the size of the economy in the chosen nation, is influenced by a number of different factors. It follows from the formula for calculating the GDP that is given in the methodology section that the components that enter it directly affect the size of this indicator, and as a result, it is possible to assume dependence on the basis of the theory. This follows as a result of the fact that this indicator is given in the methodology section. In the section of this essay devoted to practice, our objective was to determine the degree of dependency in the field that we are investigating, specifically in the service industry, paying special attention to SSCs. In the following section, we will discuss the rationales for our findings as well as the possible explanations for them.

a) Although we assume that growth in FDI adds to growth in GDP or GDP p. c., our model showed that there is a negative correlation between the two variables. This observation can be rationalized by pointing out that the effects of FDI aren't seen until much later. Therefore, the influx of FDI in 2019 does not have an influence on GDP p.c. in 2019, but it is reasonable to expect that it will have a favorable impact on GDP p.c. within the subsequent time periods. FDI

in Central and Eastern European countries has been a crucial indicator of economic development as well as foreign economic faith in the stability and development of their economies (Hlavacek and Domanska, 2016). During the course of the economic transformation, FDI in the countries of Central and Eastern Europe have evolved into a significant indicator of the economic development of those countries as well as an indicator of economic confidence on the part of external economic actors in the stability and growth of those economies.

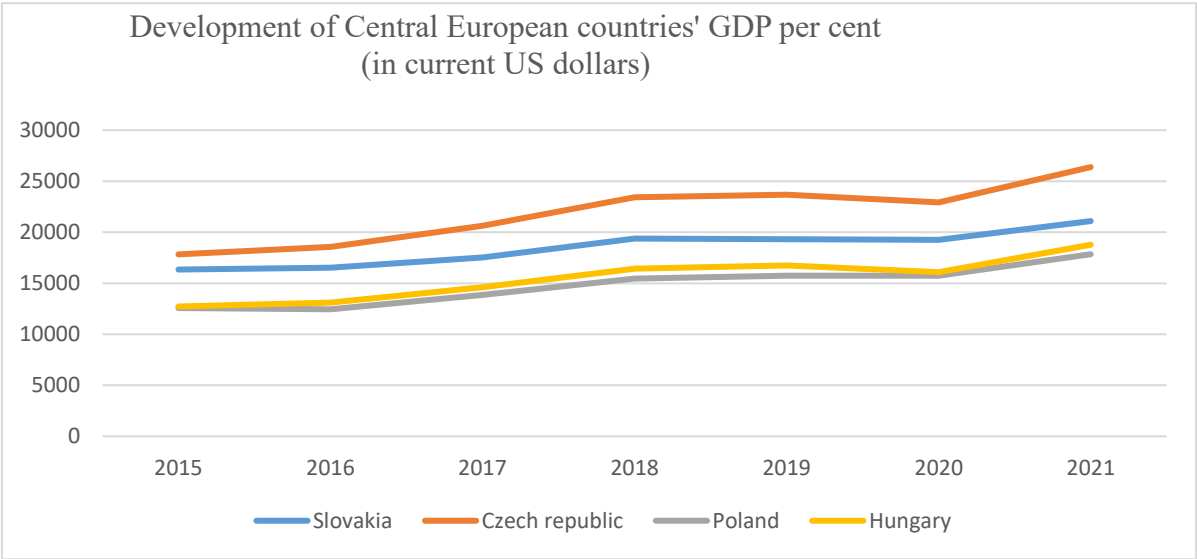
b) When it comes to the export of services, there is typically a beneficial effect on the GDP p. c. The formula that is used to calculate GDP can provide an explanation for this particular event. The computation of GDP includes the export of services as a component of net export as one of its fundamental building blocks. Services make a sizeable contribution to the formation of GDP, which is a characteristic feature of developed countries, which includes the countries we are watching (the EU), as was indicated in the opening part of the article. This is a trait that is unique to developed countries.

c) We mentioned SSCs as one of the important areas under services where FDI flows in the introductory section of the essay. SSCs offer a diverse selection of services to businesses located all over the world. These are essentially services that are offered in the areas of research and development, accounting, human resources, and finance, amongst other areas. In the countries that make up the EU, there is no standardized approach to reporting the proportion of SSCs contained within FDI. Even the countries themselves do not have clearly set reporting and classification of the services offered by these centers or the canters that are located inside their borders. We have made the decision to use the indicator of service export in ICT for the purposes of processing this article. This is the category under which the majority of the cantier activities that were listed were included in the database.

The following graph shows how the dependent variable changed between 2015 and 2021 in Slovakia, the beginning point for our future research, as well as in other Central European countries.

Fig. 1 – Development of GDP p.c. in the countries of Central Europe in the years 2015 – 2021 (current US\$).

Source: processed by the author based on WORLD BANK (2022) data



The investigated countries' GDP p. c. has increased similarly over the observed time. The COVID-19 pandemic, which produced a general slowdown in the economy, i.e., individual activities that contribute to the development of GDP, or GDP p. c., is to blame for the decline in the index in 2019 and 2020. Individual economies were relaunched in the final year (2021),

and the indicator once more achieved higher values compared to earlier times. The process of integrating economies into the European and global production chains was hastened by the Central and Eastern European countries' admission into the European Union, which also enhanced the influx of FDI (Hlavacek and Domanska, 2016). The graph above also illustrates how significant this was for future economic growth.

## 6 CONCLUSION

It was conceivable to postulate the presence of a relationship between GDP p. c. and FDI or export on the basis of economic theory. This article's objective was to explore the service sector as a field to which developed countries like Slovakia and other Central European countries must give close attention if they are to maintain the upward trend of the studied indicator. SSCs are a unique subset of the service industry, which is underappreciated in Slovakia while being one of the major donors to the national budget and one of the biggest jobs there. As was said in another section of the article, the influence of SSCs on the country's economic level cannot be precisely assessed because there is no generally defined technique for reporting metrics connected to this sector.

In this particular setting, however, it is impossible to ignore the fact that, in addition to the services sector, other industries also contribute to the formation of GDP, and that other industries also receive a steady amount of FDI. The research of the influence of FDI flowing into the production sector on the generation of GDP or GDP p. c., followed by a comparison with the findings reported in this article, will be the focus of the next article that we write.

- It is also necessary to mention the limitations of our research:
- data collection is conducted exclusively through secondary sources and not primary sources;
- based on the available data, we were only able to conduct the survey on a sample of 22 EU countries;
- we can only determine the influence of SSCs on the economic growth of countries indirectly (via selected variables) because there is no uniform reporting methodology for SSCs among EU countries.

As a result, the first two independent variables will serve as the foundation for our ongoing research and any potential comparisons we make with the manufacturing industry. On the basis of theoretical knowledge, as well as the results of the most recent independent variable, which was the export of services in the field of information and communication technologies, which is also an area in which the activity of SSCs can be found, it is possible to draw the conclusion that the goal of the countries that were the subject of the research should continue to be the creation of such conditions that would motivate large transnational corporations to build SSCs in these countries. This conclusion can be reached on the basis of the results of the most recent independent variable Growth in GDP p. c. is a fundamental metric of macroeconomic health; it reflects not only the standard of living enjoyed by a nation's population but also its capacity to meet its commitments and other responsibilities.

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# A LITERATURE REVIEW ON CHANGING CONSUMER FOOD CHOICES DURING THE COVID-19 PANDEMIC

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## **Abstract**

This pandemic has influenced every aspect of life, shaking our society and affecting social, economic, and politics in a terrible way. Different countries impose confinement measures for different periods and this considerably affects consumer purchase habits. This review aims to identify how consumers' consumption and purchase of food choices have been changed and what are the main factors of these changes. For this purpose, we conducted a systematic literature review, and selected 32 papers for screening but 8 research articles were thoroughly reviewed and scrutinized. We used Atlas.ti 9 version qualitative software for content analysis. We found an interesting factors such as food-purchase decision, emotion distress, pressure on consumers, movement limitation, and financial challenges. We also found out that due to lock down people have more time to cook food at home and it decrease the purchase of ready to eat food. Another factor is fear of getting infected which make consumer to reduce the frequency of consumer to vist stores and encourage them to go for online delivery services.

## **1 INTRODUCTION**

The Coronavirus disease (Covid -19) started in December 2019. Due to its contagious nature spread rapidly throughout the world, in March 2020, WHO declared it a pandemic. (Espinoza-Ortega et al., 2021). Most countries adopted strict measures to contain covid-19, such as imposing “lockdown,” resulting in people staying at their homes. (Russo et al., 2021)

This pandemic has influenced every aspect of life, shaking our society and affecting social, economic, and politics in a terrible way. (Brugarolas et al., 2020) Food is a basic necessity and key to personal health; besides that, consumption and production of food have a significant environmental impact.

Different countries impose confinement measures for different period and this considerably affects the consumer purchase habits (Romeo-Arroyo et al., 2020). According to Murphy et al (2021), there is a shift in consumption patterns regarding home-cooked food. This study aims to identify how consumers' consumption and purchase of food choice has been changed and what are the main factors of these changes?

## **2 METHODOLOGY**

The systematic literature review process anchors on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Page et al., 2021). Figure 1 reflects the PRISMA flow diagram, which outlines the sequential actions undertaken to identify, screen, and include research articles in this review. A set of relevant keywords were chosen before the search query in the scientific databases. By using operator “AND” and “OR” generate a query in the Web of Science and Scopus database. The search query resulted to: nWOS=10 and nScopus=42 scholarly papers. We further filtered the result and excluded scholarly, articles not published in journals, articles not in the economics and business. In so doing, it substantially reduced academic papers. Then, we excluded 8 duplicated records leaving 32 articles in the screening stage. Screen each article based on title and abstract manually and exclude which are not food-related. This procedure further discarded 10 articles,

hence, sought 22 papers for retrieval. Nevertheless, 2 of the papers were inaccessible, leaving 20 of them for full reading and analysis. However, did not include papers which are not related to purchase and eating behaviour, 12 more papers were not within the scope, hence excluded. In total, 8 research articles were thoroughly reviewed and scrutinized.

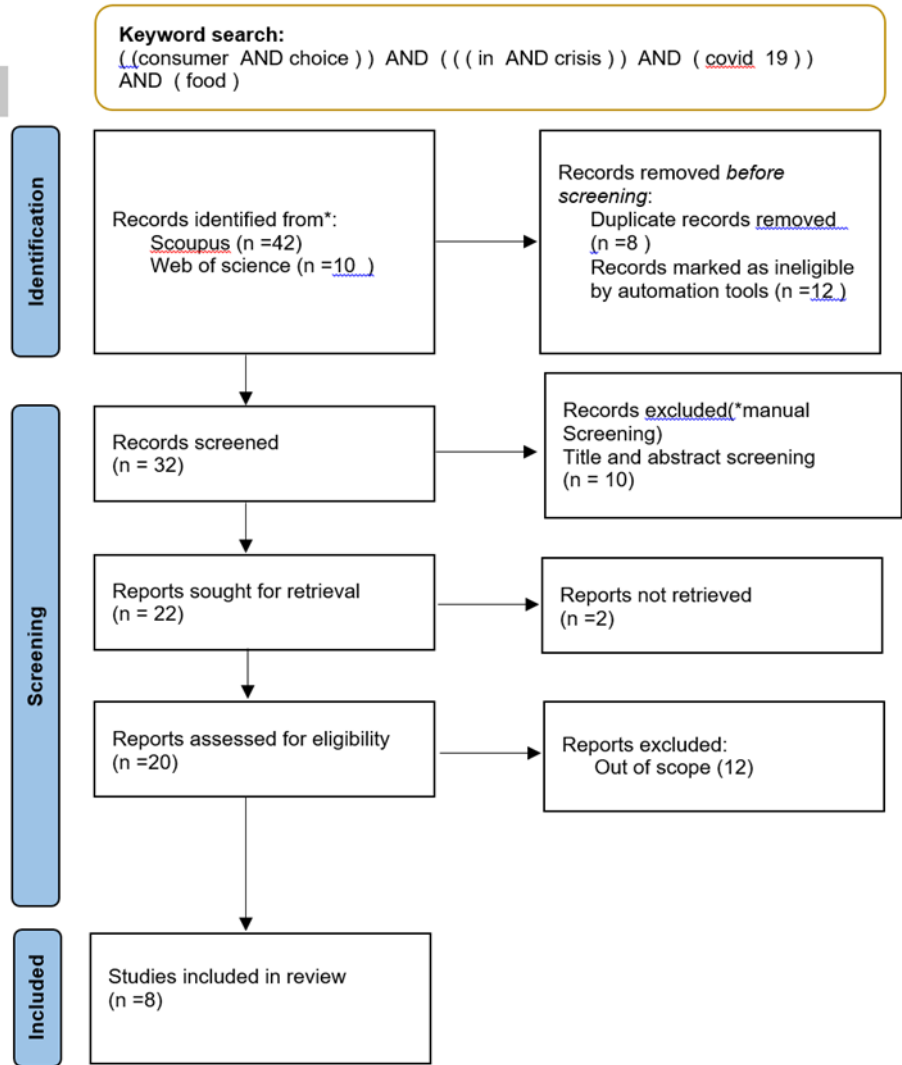


Fig. 1 – Systematic literature review process adopting PRISMA Guidelines. Source: Page et al. (2021)

### 3 RESULTS AND FINDINGS

After carefully selecting articles, table 1 explain the aim and objectives of the chosen papers and then discusses the finding of each article.

Tab. 1 - Aim and objectives of the reviewed articles (source: researcher own)

Author	Country	Aims / Objectives
(Espinoza-Ortega et al., 2021)	Mexico	Determine the food preferences and consumption patterns of Mexican families during the peak contingency period caused by the COVID-19 epidemic.

(Fanelli, 2021)	Italy	Analyze and assess the effects of the Coronavirus Disease 2019 (COVID-19) pandemic on the eating habits and food-related behavior of Italian consumers.
(Gómez-Corona et al., 2021)	Mexico, Spain and Peru	To gain a cross-cultural understanding of the major consumer fears associated with food and COVID-19.
(Hesham et al., 2021)	Saudi Arab (UAE)	To better understand some of the factors and moderators of healthy food purchasing decisions by consumers.
(Murphy et al., 2021)	(Island of Ireland (IOI), Great Britain (GB), United States (USA), and New Zealand (NZ))	To compare changes in consumer dietary patterns across continents throughout the COVID-19 epidemic.
(Poelman et al., 2021)	netherlands	Examined changes in eating behavior and food purchases among Dutch individuals during COVID-19 and socio-demographic variations.
(Russo et al., 2021)	Italy	Investigates the relationship between the psychological impact of the lockdown and predicted longevity of the shift in consumption behaviors.
(Romeo-Arroyo et al., 2020)	Spain	To investigate customers' food choices and habits during confinement, and to identify potential unhealthy dietary habits.

**Espinoza-Ortega et al. (2021)** identified four groups of consumers in the Mexican population. “Budget consumer” families are with lower income and education levels and this group reported a larger reduction in alcohol and soft drink consumption. “Hedonics” give importance to a health factor, and this group decrease the consumption of alcohol and soft drink but increase the consumption of fruits and vegetables. “Price Conscious” households give importance to economic factors, and this group increases the consumption of fruits and vegetables. The last group is “Conscious” which gives importance to almost all factors, especially weight control, health, and hedonism. This group stated the highest increase in fruits and vegetable consumption and mentioned the importance of organic food.

**Gómez-Corona et al. (2021)** observed nine dimensions of consumer’s fear regarding Covid-19 and food i.e. social, basic need, emotional, food- delivery, government, over-eating, family conflicts, food supply and immunity. This study also found that consumers of Peru fears are related to food supply and food immunity. They buy larger portions of ice cream, rice/grains, fresh meat/poultry, potatoes, and eggs. However, social fears are higher in Spanish and Mexicans. Spanish people buy a bigger proportion of wine, beverages, plant-based products, and consumers of all three nationalities bought more items related to basic needs such as bread, nuts, and some savory products.

**Hesham et al. (2021)** suggested that Saudi women are more afraid of getting infected while doing shopping than men. Their research also revealed that older people are more fearful of getting Covid-19 than younger people. In contrast, people generally decrease their visit to places like restaurants and shops and avoid gathering places. Another interesting aspect of



research is people intention to buy reveal that Saudi consumers increased the purchased of healthy food.

**Fanelli (2021)** noted that Italian consumers purchase food from small retail stores and the frequency of food shopping has increased as well. Interestingly consumers prefer healthy and home cooked meal instead of ready-to-eat-food. They also give importance to the nutrition to provide support to their immune system. This also found relationship between stress and emotional eating, which means that people under stress consume food which has more fat and sugar content.

**Murphy et al. (2021)** conduct cross-sectional online survey and gather data from Island of Ireland (IOI), Great Britain (GB), United States (USA), and New Zealand (NZ). In this study they discovered that regions with sticker restriction such as IOI and NZ did not increase food management practices. Interestingly additional free time contribute in increase in consumer to cook at home with fresh and basic ingredients and away from ready to eat food. Business like hotel and restaurants even grocery stores do rapid transition towards delivery services to be financially sustainable.

**Romeo-Arroyo et al (2020)** determine Spanish consumer eating style by using Dutch Eating Behavior Questionnaire (DEBQ) and categories respondent by “External eater” (67%), “Restrain eaters” (23%), and “Emotional eaters” (10%). Furthermore they conduct Hierarchical Cluster Analysis (HCA) to identify attitude related to food and cooking attitudes question (F&C). And discern three clusters of consumers i.e. “self-control” consumer choose food due to its health benefit. Whereas “Sensitive” people give great importance to the pleasant character of food and consider meal time as most important moment of the day. And “non-emotional” is characterized by people who has lowest score in mood related questions probably choose comfort and palatable foods.

**Poelman et al (2021)** reported that majority of Netherlands’ consumer did not change their food purchase and eating behavior during lockdown. But interestingly enough socio-demographic differences were detected among the consumer who make changes during lockdown. Such as people who are overweight and obese eat unhealthy food, and more like to purchase snacks and non-alcoholic beverages, as compare to people with healthy weight. Another interesting finding was educated people care more about their health and choose healthy food. Educated people use meal delivery services much frequently than uneducated people.

**Russo et al (2021)** stated that understanding the factors of demand for new product play an important role in competitive advantage of the firms. They identify two approaches to change in food purchasing decision: reflective approach and impulsive approach. Impulsive approach is when there is high chances of consumer buy new product during lockdown and it is associated with younger consumer. On the other hand in reflective approach there is lower chances of buying new product but once consumer buy it they keep it for longer run. They also suggested that psychological pressure was associated with impulsive approach to buy food.

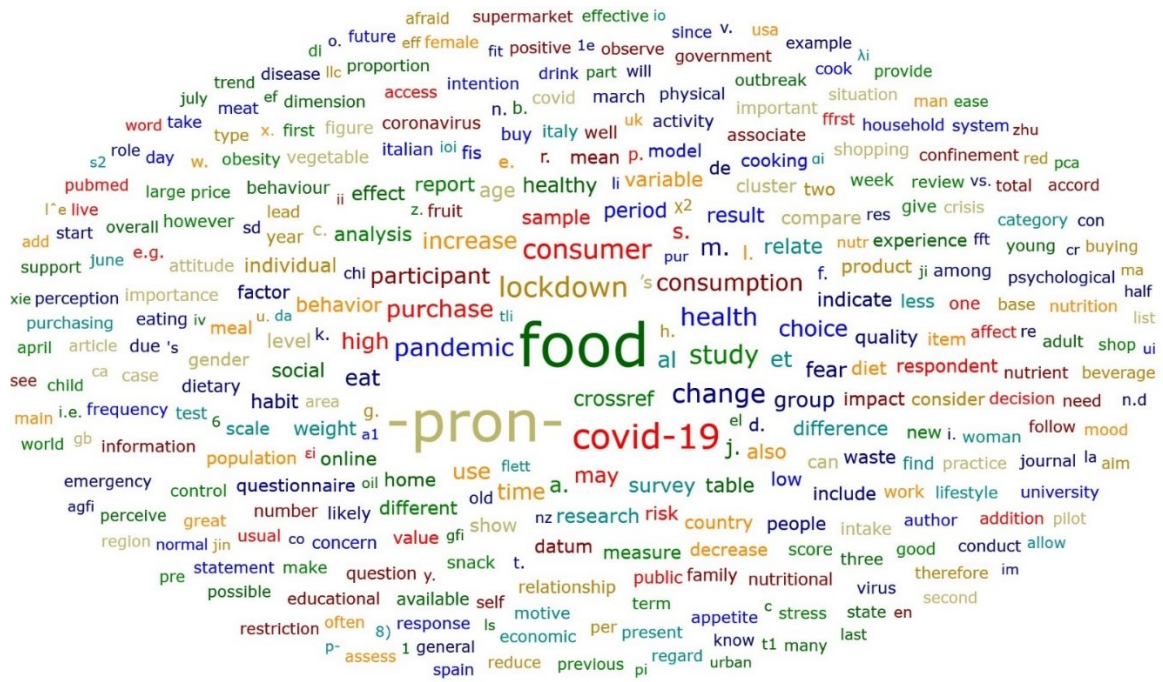


Fig. 2 – World Cloud. Source: Atlas.ti 9 Version



Fig. 3 – Framework on Consumer Food Choices during COVID-19. Source: Atlas.ti 9 Version

## 4 FURTHER RESEARCH AND DIRECTIONS

Many researchers found that people consume unhealthy food during covid-19 especially vulnerable consumer such as low income, undeducated and consumer with health issues. Importantly, our literature review suggests a fresh avenues for future researchers to address a under-researched research questions in the food changing behaviors due to global pandemic.

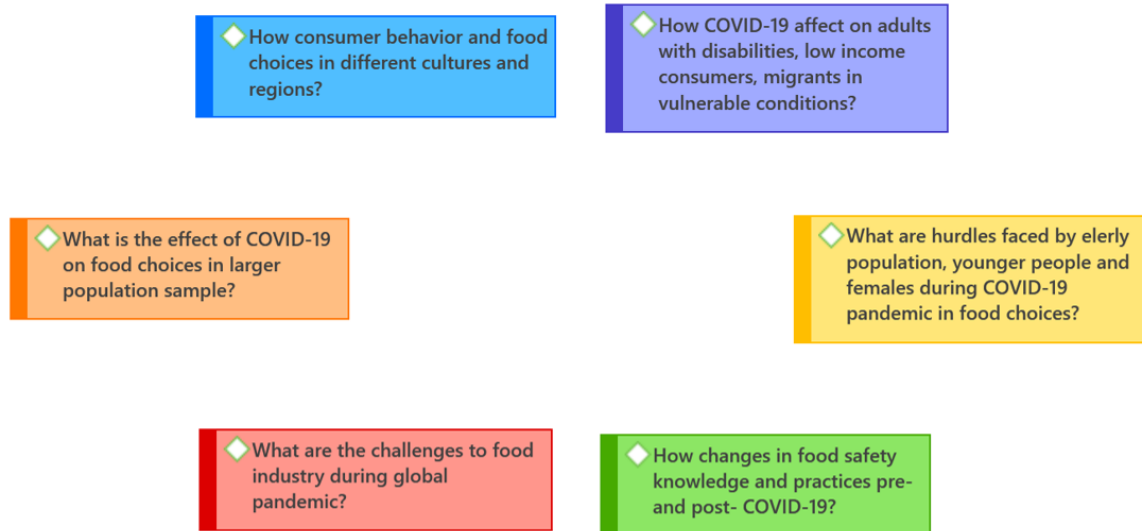


Fig. 4 – Future Research Questions. Source: Atlas.ti 9 Version

## 5 CONCLUSION

The comprehensive review reveals that there are several factors which impacted the consumer purchase and food consumption behavior during pandemic. Due to lock down people have more time to cook food at home and it decrease the purchase of ready to eat food. Another factor is fear of getting infected which make consumer to reduce the frequency of consumer to vist stores and encourage them to go for online delivery services. There is also strong relationship between stress and emotional/ unhealthy eating behavior.

The limitation of this study is that it only focuses on consumers' purchase and eating behavior. And did not include other challenges that the food industry has faced, such as the impact of the pandemic on restaurants and the supply side of the retail business. This paper will help us in understating consumer purchase behavior during pendamic. It will also help companies to make marketing strategies that help them in the long run.

### Acknowledgement

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# BEHAVIOR OF MIGRANTS' REMITTANCES IN SLOVAKIA

*Raman Herasimau*

## **Abstract**

The migration process becomes more and more intensive in the European region. Regional wars and crisis are speeding up the migration volumes even more. This process has great impact on different parts of the state system: healthcare, labor market, education, pension system, family support system, fiscal system etc. In 2022 CEE countries experienced immigration processes more than other EU ones. Financial resources usually transfer together with people. The aim of the paper is studying relationships between remittance flows and macroeconomic estimates in the framework of data lack. It is a try to find how remittances behave in respect of basic macroeconomic variables. The used methodology consists of combination of econometric and statistical models: first, has been used Friedman's supersmoother for noise elimination, then has been used ARIMA model for the forecast and finally regression analysis. The study demonstrates that remittance flows are influenced more by other factors than GDP or number of migrants. In addition to host countries, model should include home countries with a wide range of variables.

**Keywords:** *Remittance flows, migration, private transfers, Slovakia.*

## **1 INTRODUCTION**

The primary factor of migration from the receiving country perspective is population aging and from sending country is a low level of life.

Population aging has a strong impact on labor market and persons' consumption as well as on public finances.

Today the aging countries are high-income and middle-income ones. Regards, countries should reckon with aging effect and pressure on healthcare system, thus, adequate policies should be fashioned.

Globalization brings to countries both benefits and challenges. The migration from the one side is a problem in case if it's uncontrollable process and vice versa it's beneficial if migration policy is smart. Global situation of migration process shows the growth from year to year. The total number of migrants in 2020 was more than 280.5 million people that made 3.9 per cent of the total world population Figure 1 (McAuliffe & Triandafyllidou, 2021).

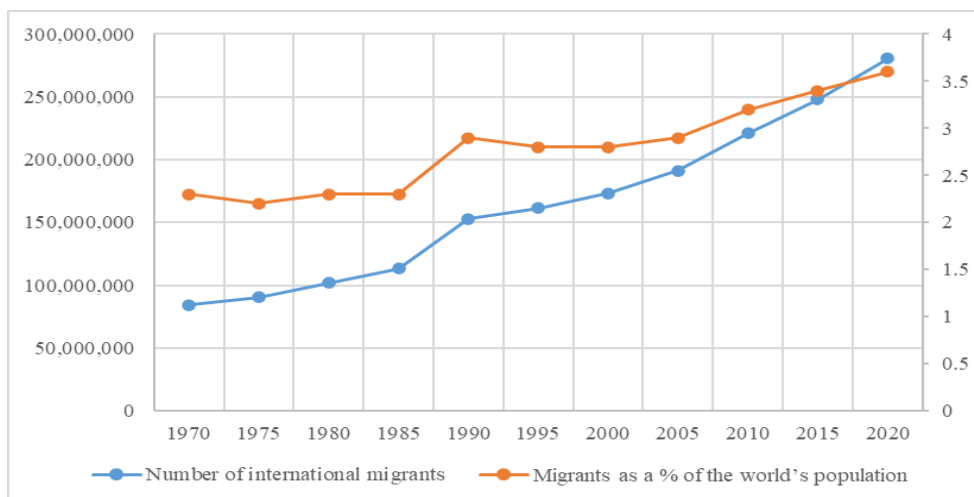


Fig. 1 – International migrants, 1970 – 2020. Source: Author’s presentation based on <http://oecd.stat.org> and <http://datacube.statistics.sk/>

Majority of those people, 65 per cent, live in high-income countries and 31 per cent in middle-income countries (United Nations Department of Economic and Social Affairs, 2020). Thus, there is a partial compensation of population aging in high- and middle-income countries.

The statistic of Slovakia shows us the similar scenario, while population is aging, and the number of immigrants is growing. The mean age of Slovak population during last 7 years increased from 39.60 to 41.26, while the number of immigrants increased more than twice: from 71.6 thousand to 167.5 thousand people in 2021 Figure 2.

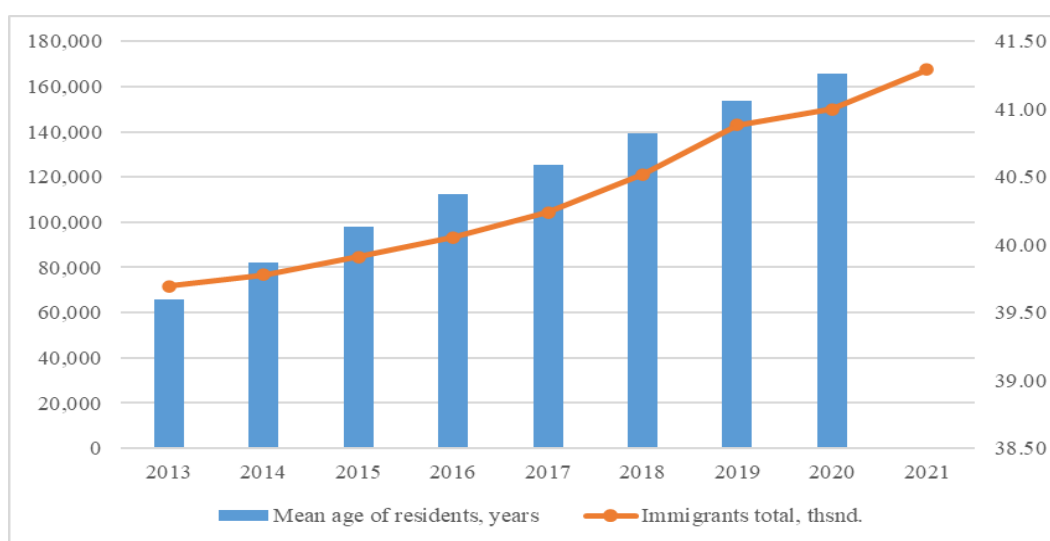


Fig. 2 – Changes of immigration and mean-age in Slovakia, 2013-2020. Source: Author’s presentation based on <https://www.minv.sk/?rocnky> and <http://datacube.statistics.sk/>

The Figure 3 is presenting changes in the number of immigrants from the 3<sup>rd</sup> countries (outside the EU) based on the type of residence permissions. Statistics shows that Slovakia becomes more and more attractive for foreigners. The number of temporary residence permissions grows extensively moreover with the 5 years gap the number of people with permanent permissions is showing increasing as well. Most of these people are working force and entrepreneurs and the rest belongs to family reunification, study, Slovaks abroad and other types.

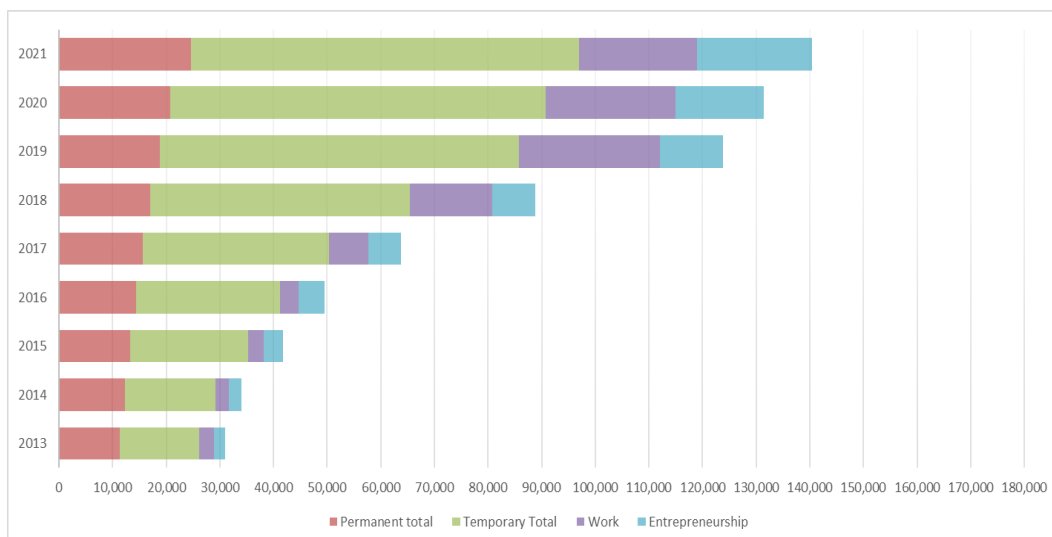


Fig. 3 – Changes of the immigrants from the 3<sup>rd</sup> countries in Slovakia, 2013-2021. Source: Author’s presentation based on <https://www.minv.sk/?rocnky>

Based on existing data the forecast (Holt, 2004 & Herasimau, 2022) of future number of immigrants in Slovakia has been made Figure 4.

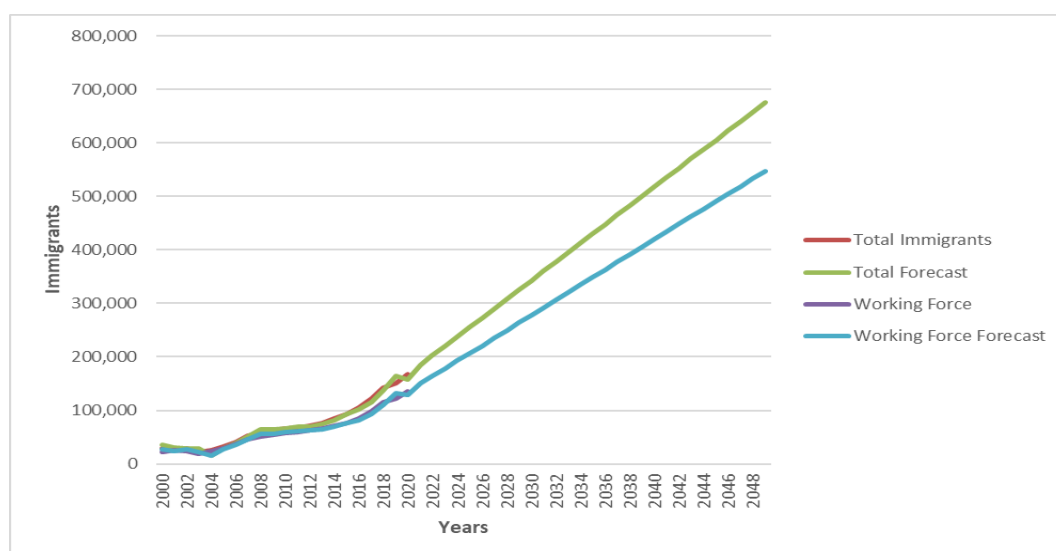


Fig. 4 – The forecast of Immigrants, Slovakia, 2000-2050. Source: Author’s own calculation.

The total number of immigrants is expected to be 675 222 people in 2050 and 547 387 of them will be working force. In 2020 and 2021 the share of working immigrants was 81.1 per cent. There is a net growth of foreign working force in Slovakia. Needless to say, that forecast shows only the direction with the same conditions of the economy, in case of unexpected occasions everything could change dramatically.

Aging population goes alongside with strong migration process. Based on current situation in demography the future population of Slovakia is moving to higher age groups Figure 5 (Herasimau, 2022).



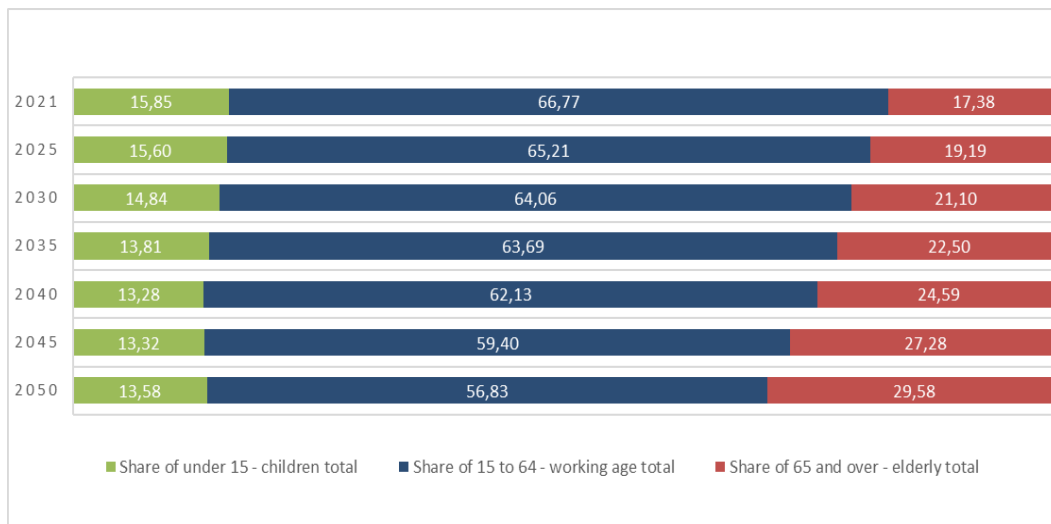


Fig. 5 – Population share, by broad age group (projection), Slovakia, 2021-2050. Source: Author’s presentation based on <http://oecd.stat.org>

Both young and working-age populations are expected to decline, while elderly ages will go up. Great changes in demography influence the state budget as well as the financial system. Migrants are not only having financial profits and are paying taxes in place of stay but also send money to home countries, therefore outflows and inflows of remittances appear.

The total remittances all over the world in 2020 were 702 billion dollars US (IOM, 2022).

The immigrants tend to save more than natives. We can understand remittances as a part of savings. There are several reasons why immigrants remit: altruism, exchange, a strategic motives, insurance and moral hazard, family loan arrangements, inheritance as an enforcement device, mixed motives (Rapoport & Docquier, 2005). Altruistic reason is pretty clear – migrants send money to support their families. The second motive is when migrants try to finance something e.g. taking care of the assets or family or elderly members. Sometimes it means compensation of previous loan used to finance emigration. Strategic motives mean the interaction between skilled and unskilled migrants. For the reason migrants are heterogeneous in skills host country’s employer tend to pay based on average productivity of the minority group, thus there appeared to be an arrangement between skilled and unskilled employees when the first ones “pay” to latter in order to keep them at home. We can witness Insurance and moral hazard motive in agricultural developing countries where weather is exogenous and unpredictable. Therefore, income is volatile and due to lack of insurance market rise intra- and interfamilial coinsurance arrangements, they often apply allocation of some members outside the region or even country. Family loan arrangements motive is similar as investment motive, in this case migrant returns investments made by his/her family, for example, in education. The motive inheritance as an enforcement device rises when informal contract between family and migrant exist, in addition contract execution is supported by punishment or social norm stimulus. Mixed motives are the combination of all mentioned above, one migrant can have several of them and also many other e.g. personal savings in home country.

If immigrants return home, they continue to save more than other natives, so they have two peaks of saving during their life cycles (Dustmann, 1995).

As we can see there is a big transformation of migration process, migrants not only slow down the aging of the country (Lee & Mason, 2010) but also bring new knowledges and additional financial resources to home country.

Slovakia is not the exception. As it was mentioned, country is facing aging growth as well as both immigration and emigration increase.

In case of Slovakia there is a gap in understanding of remittance's behaviour. In this paper I'm trying to find relationship between remittance movements and macroeconomic factors.

## 2 METHODOLOGY OF THE PAPER

To answer the main aim of the paper I need to solve issues with the small size of the sample. Remittance data is presented only on annual basis, thus other variables should be annual too. The second issue is that not all data is presented for the same period, e.g. GDP is given from 1990 to 2021 rather remittance outflows are only from 2013. In this regard, sample should be increased and forecast will be done accordingly. Firstly, it will help have better understanding of the future and secondly will provide larger sample for relationships between remittances and selected variables. This paper contains two main sets of analysis: remittance outflows and inflows. Remittance outflows are money sent by immigrants from Slovakia to home countries and remittance inflows are money sent by Slovaks abroad to Slovakia.

Collected data is presented in Appendix 1. Table 1 describes variables for analysis from the Appendix 1.

Tab 1. – List of variables. Source: Author's own calculation.

Full names	Abbreviation for computing
Gross domestic product	gdp
Remittance outflows	rem out
Remittance inflows	rem in
Education expenditures	edu exp
Average wage	wage
Number of immigrants	n im
Number of emigrants	n em

All data is presented in US dollars in prices of 2015. Variables GDP, remittances and education expenditures are in millions, emigrants and immigrants are in persons and wage is in US dollars. The number of immigrants is collected from "Statistical overview of legal and illegal migration in Slovak Republic for the years 2000 – 2021". Number of emigrants is collected from OECD. OECD database contains better presentation of emigrants than EUROSTAT, at the same time both seriously underestimate emigrants' population. I used OECD migration database and summarized all Slovaks stated as immigrants in other countries, because OECD doesn't provide direct database of emigrants, gender specific was not considered. The number of immigrants is presented as a number of valid residence permissions issued by Ministry of Interior of the Slovak Republic.

The analysis consists of three steps: First we need to reduce noise of the variables and make data stationary. Because of annual data and small sample there is much noise. For this purpose, I use Friedman's super smoother (Friedman, 1984). It is nonparametric regression estimator based on local linear regression with adaptive bandwidths (Luedicke, 2015, p.1). The idea of this method is to smooth sample several times and receive the most accurate estimator.

For the forecast (second step) I use ARIMA model. The model is taken in the form of  $arima(2,1,1)$ , where the first value is  $p$  – lags of autocorrelation the second value is  $d$  – time lag or difference and the third one is  $q$  – lags of moving averages. Partial autocorrelation and autocorrelation show that it's the best combination of the model Appendix 2. The time lag of 1 is used due to the test of Dickey-Fuller. It shows that a variable follows a unit-root process. The  $p$ -value is less than 0.05 only for the 1 step lag. The third step is regression analysis. I use

multiple linear regression for this purpose. The independent variables are remittances (inflow and outflow).

### 3 RESULTS

After the smoothing procedure we can see results in Figure 6. Smoothing closely fits with the original data and adjusts it – the white noise has been reduced and residuals have been normally distributed.

The model shows that the steady growth of every single variable in absolute numbers, with simultaneous slowing down of the growth year to year Figure7. The dash lines is a forecast, and solid ones is an actual data. All forecasts show that during the time growth pursuits to be in the same values.

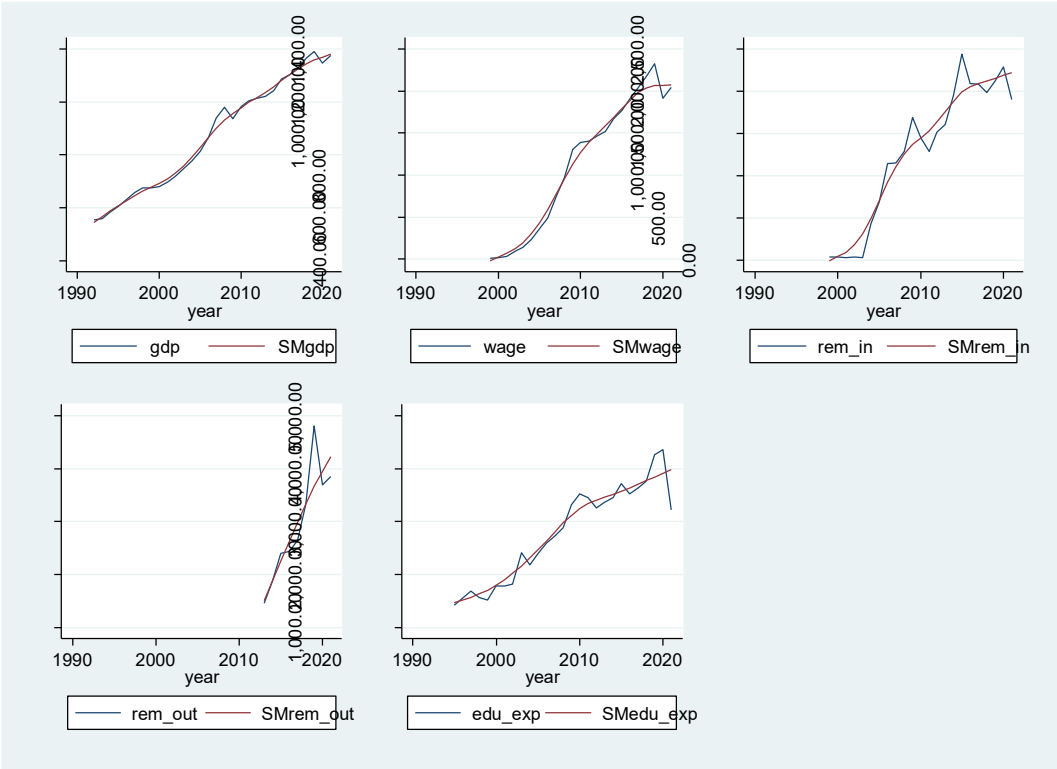


Fig. 6 – Friedman’s supersmoothing procedure. Source: Author’s own calculation.

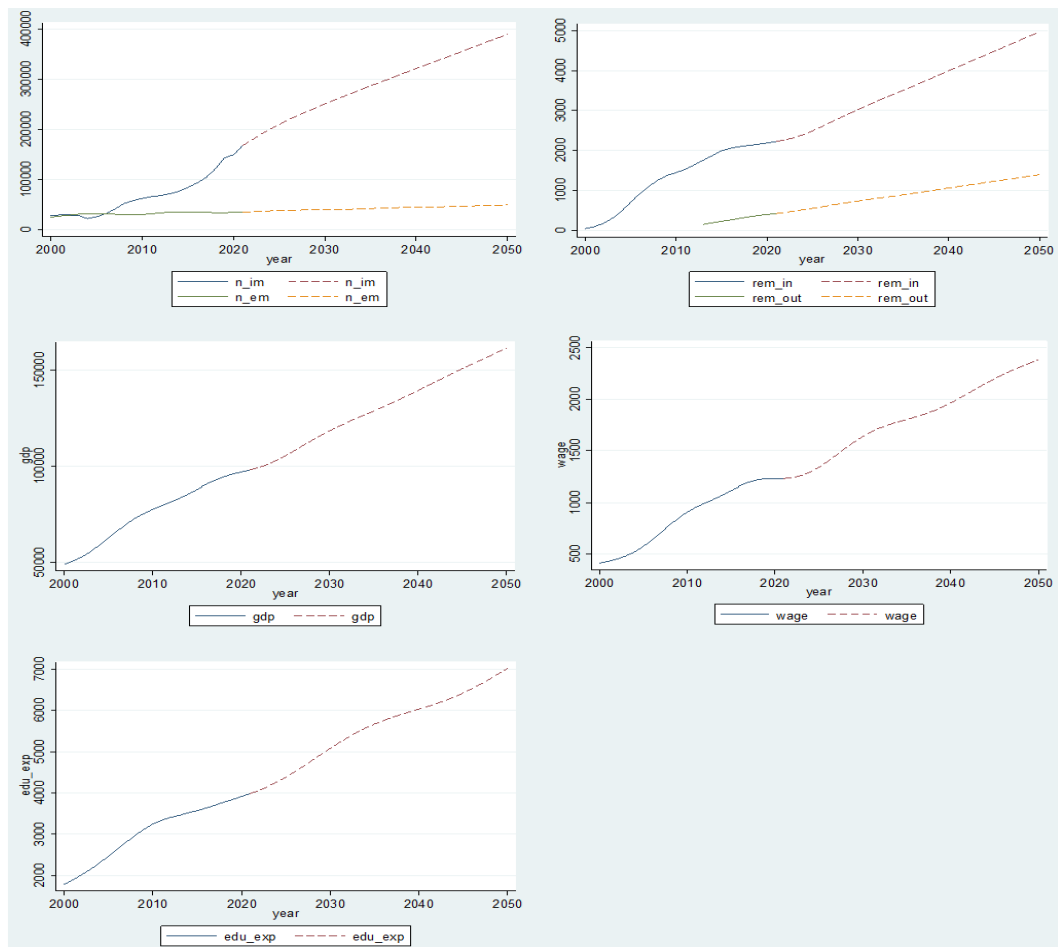


Fig. 7 – Continuously model, actual and forecast. Source: Author’s own calculation.

Ones the model is finished lets continue with analyzing the remittance inflows and outflows.

Tab 2. – Regression output for remittance outflows. Source: Author’s own calculation.

Source	SS	df	MS	Number of obs = 38		
Model	5094389.92	4	1273597.48	F( 4, 33) = .		
Residual	69.9140893	33	2.11860877	Prob > F = 0.0000		
Total	5094459.83	37	137688.104	R-squared = 1.0000		
				Adj R-squared = 1.0000		
				Root MSE = 1.4555		

rem_out	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
gdp	.017786	.0002917	60.97	0.000	.0171925	.0183796
wage	-.1894645	.0144868	-13.08	0.000	-.2189381	-.1599909
n_im	.0006875	.0000233	29.50	0.000	.0006401	.0007349
edu_exp	-.0323634	.0031493	-10.28	0.000	-.0387707	-.025956
_cons	-1074.681	10.86436	-98.92	0.000	-1096.785	-1052.578

Results are showing strongly that all variables have p-value less than 0.05 – variables are significant. The positive impact on outflows of remittance has GDP and number of immigrants, what is rather obvious. At the same time there are negative relationships between wage and remittances that means that growth of wage doesn’t lead to the growth of remittances similar to

when education expenditures don't show positive correlation. Therefore, we can assume that remittance outflows is influenced by other variables which are not included in this regression.

Tab 3. – Regression output for remittance inflows. Source: Author's own calculation.

Source	SS	df	MS	Number of obs = 51		
Model	94837032.6	4	23709258.2	F( 4, 46) = 4526.30	Prob > F = 0.0000	
Residual	240953.164	46	5238.11227	R-squared = 0.9975	Adj R-squared = 0.9972	
Total	95077985.8	50	1901559.72	Root MSE = 72.375		

rem_in	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
n_em	.003541	.0091793	0.39	0.701	-.0149359	.0220179
edu_exp	-.1490275	.1235411	-1.21	0.234	-.3977028	.0996479
gdp	.0306849	.0090605	3.39	0.001	.0124471	.0489228
wage	1.009414	.3800347	2.66	0.011	.2444436	1.774384
_cons	-1560.974	224.6353	-6.95	0.000	-2013.141	-1108.806

Remittances made by Slovaks abroad shows that the number of emigrants and education expenditures are not significant for regression. Growth of GDP and average wages in Slovakia don't lead to decrease of remittances and emigration as a result. Negative correlation between remittance inflows and education expenditures looks logically, because if state invests in human capital more educated people earn more and as a result send more money to home country, but regression shows that edu\_exp is not significant.

The results demonstrate that remittances have other behavior from selected macro indicators. Rather weak relationships between them tells us that growth of remittances is not strongly connected with a growth of migrants.

#### 4 DISCUSSION AND CONCLUSION

The migration process becomes more and more intensive therefore social policy should be adapted to new realities. Changes in migration bring problems like aging, decrease in fertility rate and productivity but also can be beneficial thorough new working force and remittances. The analysis show that country usually left by more educated people, because they have more possibilities in labor market outside their countries. At the same time, they send more money to home countries what is beneficial in short-run, also if emigrants return at home they bring new knowledge and skills and tend to have higher saving ratio. From the other side immigrants usually are at their working-ages, partially they compensate left native working-force. Immigration in Slovakia depend more on wages rather GDP growth. Remittances outflows strongly depend on the number of immigrants. For a sake of clarity, I faced with a problem of poor data availability. None of used databases hadn't full information about emigrants, immigrants and remittances. Therefore, forecast ARIMA model was created in order to extend number of observations. The results show that none of used variables are significant for remittance flows at least at annual basis. Thus, and so, there is a chance of underestimation of variables. The future modeling is needed as well as a more qualitative dataset. The future studies of remittance flows should include information about home countries and host countries, so we can find out what variables have greater impact on remittance flows. The future studies should contain main countries from which immigrants come, and for emigration I will look at the most

popular countries for Slovaks. This detalization will help to look more precisely on specific country and find general relationships between countries and remittance behavior. At the end the findings can be applied to all populations of migrants of Slovakia.

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# AN ASSESSMENT OF ONLINE REPUTATION OF GLOBAL BICYCLE BRANDS BASED ON THEIR SOCIAL MEDIA ACTIVITIES

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## Abstract

Current global incentives highly favour transition to green modes of transportation. Bicycle mobility has therefore become one of the most appropriate modes, and its popularity has gained traction especially during COVID-19 times. Bicycle industry as a whole has recorded significant boom recently, mainly as a consequence of global pandemic situation, but also as a result of green policies of countries. The popularity of cycling is on its all-time high, which also transferred to rising sales of bicycles worldwide. In this paper, we examine how the most popular global bicycle brands deal with challenges in the online environment and how they manage their online reputation.

**Keywords:** *cycling industry, bicycle brands, online reputation, online reputation management, social media*

## 1 INTRODUCTION

Bicycle transport or cyclomobility is currently ranked among the sustainable modes of mobility. Environmentally responsible countries are therefore highly interested in cyclomobility and its efficient implementation. Cyclomobility still has potential for further development and thus we can expect growing interest in this environmentally friendly mode of transport, especially in cities.

The strategic plans of countries worldwide are linked to the intention to expand green mobility modes and replace traditional fossil fuel-based modes of transport. Bicycle industry, as a result, has recorded unprecedented growth and the demand for bicycles has reached all-time heights. The fight for customer between bicycle brands intensified, and the Internet and social media are now key tools for brands promotion. With the adequate use of digital technology, brands can communicate with the public online, they are also able to create specific content and that finally translates into their online reputation.

In general, reputation is very important factor, as it impacts the public perception of company. A positive corporate reputation can be considered as an asset because it can eventually bring benefits for company and improve its performance. The importance of corporate reputation is unquestionable especially in context of digital environment. The Internet and digital technologies have become dominant forces and companies therefore have to carefully manage their reputation in the online environment. Online reputation of company depends on multiple factors – especially social media play huge role, and their impact on the level of corporate reputation in online environment is essential. It creates the pressure on companies to involve in online platforms communication. Involvement alone, however, is not enough – companies should be also interested in assessing the level of their online reputation. Online reputation level evaluation is a complex issue, but it is possible to measure and estimate it with the use of adequate methods. The data obtained from most popular social media are valuable source of information for companies considering their online reputation. Number of fans, followers or subscribers are metrics which inform about the popularity of company in online environment in relation to other companies. These metrics are suitable for corporate online reputation assessment – they enable companies to compare themselves to competition or whole sector.



## 2 THEORETICAL BACKGROUND

As the topic of the article is aimed on bicycle brands, we consider it is important to further specify cycling industry as a whole. According to Blondiau et al. (2016), cycling industry or bicycle industry is a sector of the economy that deals with the production or use of bicycles and bicycle components. Cycling industry includes the following groups of companies:

- bicycle manufacturers
- bicycle parts manufacturers
- bicycle accessories manufacturers.

There are also other subjects active within the industry. Following groups of subjects are also important for optimal function of the whole sector (Blondiau et al., 2016):

- distributors
- retailers
- cycling organizations
- organizers and promoters of cycling events
- bicycle service shops.

Companies which operate within the cycling industry create complex supply chains. Such cooperation is very important and its disruption may cause problems on the market, as was the shortage of final products (including bicycles) due to the negative effects of the COVID-19 pandemic.

Companies in the cycling industry are mainly B2C oriented (they sell final products to the customer), and therefore they should properly care about how they are perceived by public. This is closely linked with corporate image, corporate perception and also corporate reputation.

Corporate reputation in some way reflects, how other stakeholders are regarding a company. Burke (2011) defines an organization's reputation as very important factor, which can lead to trust and credibility in society, and thus help the company to achieve its goals. Marsden (2013) claims, that each company has some reputation (positive, negative or possibly neutral). Balmer and Greyser (2003) state, that corporate reputation is formed over a long time period and it relates to activities and actions of the company. Because of that, corporate reputation is nowadays considered as a very valuable asset (Doorley & Garcia, 2007).

Based on these general definitions of reputation, we can also describe online reputation, which is a little bit more specific topic. Online reputation is a reputation of company in online environment, and it is important element of corporate success. According to Walter (2013) corporate reputation is almost everything – it is extremely fragile one small mistake can damage it completely. All these suggestions are even more intense in the current Internet environment. People or customers can express their opinions about the brand and share online through multiple platforms. Such comments and similar online interactions are directly creating the online reputation, and companies should therefore take an active approach in its management.

The rapid rise of the Internet and social media use caused quite a significant shift – what used to be local, is now global and what used to be private, is now public. Worldwide popularity of social media means that information spread not in days, but in hours or seconds.

The issue of online reputation relates to another term: online reputation management. Online reputation management is the process of analysis and management of entities reputation (people, organizations), which is characterized by the existent content on the Internet and within

all kinds of online media. Despite the companies are interested about brand protection and brand awareness, often times they underestimate the importance of online reputation management. What is crucial for companies or organizations, it is the monitoring of the online environment and the ability to flexibly react when people express their opinions about them (Hung et al., 2012).

The aim of the online reputation management is to monitor media, detect relevant contents, analyze what people say about company and interact with public or customers, too. Especially negative comments may influence reputation of company. Online reputation management consists of four key activities (Sasko, 2014):

- monitoring of the Internet and users,
- active communication with clients and public,
- evaluation and interpretation of results,
- crisis reputation management.

Online reputation management activities should protect the reputation of person, brand or business in the Internet and eliminate the causes of negative sentiment (Micháleková, Šulik & Sasko, 2016). Monitoring of online discussions, discussions forums, search engine results and even public reactions are absolutely essential. The entities should aim for as many as possible positive online references, because this type of sentiment supports corporate reputation and image. Companies therefore should:

- carefully manage the website of company,
- actively operate and communicate on the social media,
- create and publish relevant content attractive for target groups,
- ensure that positive references about the entity on the Internet are clearly visible and push negative references into the background (Hojdik & Majtán, 2018).

### **3 METHODOLOGY**

The aim of the paper is to evaluate the level of online reputation of bicycle brands with objection to social media – Facebook, Instagram, YouTube and Twitter. Theoretical background of the paper consists of definition of key areas. In this part of the work, we discuss specifics of bicycle industry, reputation, online reputation and online reputation management.

For the purposes of the practical research, the key metric is the audience size – the number of fans (Facebook), followers (Instagram and Twitter) or subscribers (YouTube). Audience size indicates the quality of marketing activities of bicycle brands in the online environment, and it is therefore closely linked to the reputation of brand.

The research sample of the study contains 22 bicycle brands, which are generally considered as the most popular worldwide. Namely, its these brands (in alphabetical order): Bianchi, BMC, Cannondale, Canyon, Cervélo, Colnago, Cube, Focus, Fuji, Ghost, Giant, GT, Kona, Marin, Merida, Orbea, Santa Cruz, Scott, Schwinn, Specialized, Trek and Yeti.

Data were collected from a survey of the social media, and was completed for official global bicycle brands profiles on Facebook, Instagram, YouTube and Twitter. Data about audience size of car brands were obtained during the period of June of 2022. Based on the obtained data, it was possible to calculate online reputation level as a TOR score, with the use of multifactor

sentiment analysis. Finally, after the calculation, we could assess the results and analyse how individual bicycle brands proceed to their online reputation management on social media.

For the calculation of Total Online Reputation (TOR) score, we used the formula, defined by Pollák and Dorčák (2013). We identified four determinants of online reputation, the audience size of each brand on the most popular social media. Standard equation (Pollák et al., 2015; Dorčák, Markovič, Pollák, 2017) features specific determinants of online reputation and their weight. The equation allows us to take into account any number of other reputation determinants. For the calculation itself it is necessary to determine the weights of individual reputation determinants which are normally determined depending on the subject and target market. If the weight of individual reputation determinants is not known in advance, the simplified formula for calculating the overall online reputation is as follows:

$$TOR = \frac{R_{ASA} + \sum_{i=1}^n R_i}{n + 1} \quad (1)$$

where

TOR – total online reputation in %,

R<sub>i</sub> – reputator/reputation factor (% score based on a given i-th determinant of online reputation,

R<sub>ASA</sub> – reputator ASA (% score based on the advanced sentiment analysis),

n – number of indicators.

In the case of our research, we excluded the reputator R<sub>ASA</sub> (it is no more relevant in current specifics of online search engines environment) and the weight of individual reputation factors is equal. The value of the total online reputation of an entity is therefore the arithmetic mean of individual indicators (partial scores of individual reputators).

In practice, four reputation factors in our research were:

- RFB (partial reputation score of brands based on Facebook audience size)
- RIN (partial reputation score of brands based on Instagram audience size)
- RYT (partial reputation score of brands based on YouTube audience size)
- RTW (partial reputation score of brands based on Twitter audience size)

After calculation of partial score it was possible to use the above mentioned formula, which determined Total Online Reputation of each brand expressed in percent. The character of the result in some way indicates share of total reputation within the online environment, as the sum of the partial and total score of all brands is 100%.

## 4 RESULTS AND DISCUSSION

This chapter summarizes the results of the research and discusses the findings. As mentioned above, the collection of relevant data was necessary in order to follow the aim of the paper – to evaluate the level of online reputation of bicycle brands, in the terms of global digital environment. Table 1 contains data about the audience size. The audience size was very important for the purposes of this study, as the online reputation calculation is based on this data. In the Table 2 we present Total Online Reputation Score for each brand, calculated with the use of multifactor sentiment analysis.

Data listed in these tables are subsequently analysed and explained in the paper. In addition, data show what is the quality level of marketing communication of brands in online environment of most popular social media. The following table (Table 1) informs about the

audience size for official global bicycle brands profiles on Facebook, Instagram, YouTube and Twitter. All data were collected manually by the survey of the official profiles on the social media. The order of the brands in the table is random.

Tab. 1 – Audience size for global bicycle brands profile on social media. Source: own elaboration based on the Internet survey of Facebook.com, Instagram.com, YouTube.com and Twitter.com

<b>Brand</b>	<b>Facebook (fans)</b>	<b>Instagram (followers)</b>	<b>YouTube (subscribers)</b>	<b>Twitter (followers)</b>
Specialized	1 988 674	1 477 987	358 000	307 416
Cannondale	790 301	339 959	81 900	117 218
Giant	1 936 085	714 333	74 600	7 529
Trek Bicycle Corp.	1 667 404	1 369 951	205 000	240 012
Merida	273 907	122 630	17 200	8 042
GT Bicycles	330 080	209 577	52 200	25 944
Kona	103 713	256 957	14 400	16 212
Santa Cruz	470 227	1 477 594	262 000	65 194
Scott	612 002	83 239	152 000	22 735
Cervélo	293 767	261 247	18 400	58 443
Marin Bikes	62 956	146 872	15 900	10 583
Bianchi	240 077	325 124	7 830	31 869
Colnago	309 954	269 063	9 400	29 491
Cube Bikes	405 906	338 893	29 900	13 112
Fuji Bikes	102 670	63 998	9 880	10 196
BMC	314 845	404 937	22 200	X
Schwinn	176 921	79 895	7 700	11 470
Orbea	332 167	405 138	116 000	41 962
Yeti	120 736	375 888	27 400	34 321
Ghost Bikes	72 977	61 394	8 340	1 954
Focus Bikes	294 843	153 589	18 300	11 980
Canyon	755 468	1 509 702	152 000	65 988

From the data listed in Table 1, it is obvious there are differences between the audience size not only between the brands, but also across the social media platforms. Generally, Facebook and Instagram are way more popular between the brands and the number of fans and followers confirm this claim.

On the other hand, YouTube and Twitter are inferior to these two platforms. For example: Specialized is a leading brand on three social media, but the difference between audience size on Facebook and Twitter is significant: number of fans on the Facebook is more than 1,9 mil. while on the Twitter the brand has only 0,3 mil. followers. It means that brands have different attitude to their strategy of online reputation management and they probably do not consider all

the social media as equally important. In the following table (Table 2), we present partial scores for each of four reputation factors with Total Online Reputation (TOR) score.

Tab. 2 – Partial scores for each reputation factor and Total Online Reputation (TOR) Score Calculation in %

Source: own calculations with the use of Formula (1)

<b>Brand</b>	<b>R<sub>FB</sub> (%)</b>	<b>R<sub>IN</sub> (%)</b>	<b>R<sub>YT</sub> (%)</b>	<b>R<sub>TW</sub> (%)</b>	<b>TOR (%)</b>	<b>Position according to TOR (%)</b>
Specialized	17,06	14,15	21,56	27,16	19,98%	1st
Cannondale	6,78	3,25	4,93	10,36	6,33%	6th
Giant	16,61	6,84	4,49	0,67	7,15%	5th
Trek Bicycle Corp.	14,31	13,11	12,35	21,21	15,24%	2nd
Merida	2,35	1,17	1,04	0,71	1,32%	18th
GT Bicycles	2,83	2,01	3,14	2,29	2,57%	11th
Kona	0,89	2,46	0,87	1,43	1,41%	17th
Santa Cruz	4,03	14,14	15,78	5,76	9,93%	3rd
Scott	5,25	0,80	9,15	2,01	4,30%	8th
Cervélo	2,52	2,50	1,11	5,16	2,82%	9th
Marin Bikes	0,54	1,41	0,96	0,94	0,96%	19th
Bianchi	2,06	3,11	0,47	2,82	2,11%	14th
Colnago	2,66	2,58	0,57	2,61	2,10%	15th
Cube Bikes	3,48	3,24	1,80	1,16	2,42%	12th
Fuji Bikes	0,88	0,61	0,59	0,90	0,75%	21st
BMC	2,70	3,88	1,34	X	2,64%	10th
Schwinn	1,52	0,76	0,46	1,01	0,94%	20th
Orbea	2,85	3,88	6,99	3,71	4,36%	7th
Yeti	1,04	3,60	1,65	3,03	2,33%	13th
Ghost Bikes	0,63	0,59	0,50	0,17	0,47%	22nd
Focus Bikes	2,53	1,47	1,10	1,06	1,54%	16th
Canyon	6,48	14,45	9,15	5,83	8,98%	4th

From the data listed in Tab. 1 it is clear, that Specialized is dominant brand according to the number of global Facebook fans. The official global profile of this US brand is currently followed by almost 2 million fans. Giant and Trek complete the elite trio as they closely follow the leader; Giant has just over 1,9 million fans and Trek 1,67 million fans. Only these three brands got over the mark of 1 million fans, as the fourth Cannondale is far behind with approximately 0,8 million fans. On the other side of the rankings we can find Marin and Ghost, and it is obvious that the difference between the TOP 3 and these two brands is massive.

In the environment of Instagram, German manufacturer Canyon leads the rankings. However, Specialized and Santa Cruz which are ranked second and third are very close. Even the fourth

Trek is within the reach of top spots, but again, there is a huge gap behind these top brands. The last spot again belongs to Ghost, which, together with Fuji are at the bottom of the Instagram followers audience size.

Specialized tops the rankings in the number of YouTube subscribers and Twitter followers, with the comprehensive difference. Strong position holds Trek (second place behind Specialized on Twitter) and Santa Cruz (second place behind Specialized on YouTube). Most of the other bicycle brands are way less consistent across these social media. From the data in Table 1 we can see, that some social media platforms (Facebook, Instagram) seems to be used more than others (YouTube, Twitter). We could further discuss the relative impact of these platforms on the online reputation, but for the purposes of the research we decided to consider all social media as equally important.

After calculation of Total Online Reputation score we can assess the position of individual bicycle brands from the perspective of their reputation in the social media environment. After applying the slightly modified multifactor sentiment analysis, we can state that Specialized is the clear winner with the total score 19,98%. Specialized has recorded the most consistent results on all of the social media. Moreover, it has the strongest position on Facebook, YouTube and Twitter, and the second strongest position on Instagram. This bicycle producer has therefore ranked in the first place, ahead of another American brand, Trek. Trek has also very consistent results which finally earned it second highest TOR score of 15,24%. Santa Cruz, another American brand placed third with score 9,93%, and it completed the American domination in the field of bicycle brands online reputation. In the fourth place we can find Canyon, which is the first non-American brand in the rankings. This German producer reached the score of 8,98%. The fifth place is occupied by Taiwanese brand Giant, with the TOR score of 7,15%.

All things considered, we can state that American bicycle brands Specialized, Trek and Santa Cruz have achieved the best and the most consistent results across all analysed social media. Their strategy of marketing communication in digital world is well balanced across all platforms what is also reflected in the TOR score of these brands. It can be stated, that these companies understand the importance of proactive approach to digital technologies, and they take steps to build and maintain high level of online reputation.

On the contrary, there are brands which represent total opposite, as they repeatedly appear on the lowest places of data tables. Particularly, we mean brands like Ghost, Fuji, Schwinn or Marin. Especially these brands should be more concentrated about social media communication in order to get wider audience and thus become more visible in the online environment, if they want to fortify online reputation.

## **5 CONCLUSION**

Adequate strategy of the online reputation management with the use of social media may lead to a long-term positive impact on corporate results. The use of online social media allows companies to increase their flexibility, especially when reacting to customer requests. They are also very efficient in providing the communication platform with the public or other interest groups of the company. Even the situation has improved recently, many companies still do not exploit full social media potential, and therefore they may not achieve competitive advantage to improve their market position.

The paper summarizes and analyses data related to bicycle brands online reputation, from the environment of the most popular social media. All analysed bicycle brands are well known in the cycling industry, but the results of research proved there are significant differences between them from social media activities perspective. According to research results, some bicycle

brands are very strong in social media communication which also positively influence their level of online reputation. However, there are some brands which tend to neglect the online communication and their online reputation is therefore negatively impacted.

This paper points out that even large global brands still have a lot of room to enhance their communication in digital environment. Improvement in this area can companies help to build their online reputation, and more importantly, it can finally lead to better corporate performance and stronger financial results.

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# DETERMINATION OF WAREHOUSE PERFORMANCE USING DYNAMIC SIMULATION

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## **Abstract**

This paper describes the effective use of dynamic simulation in warehouse performance determination. The proposed model for calculating warehouse performance and other indicators, such as the use of handling equipment or the time needed to process requests, is based on a general simulation model (Dyntar 2018, pp. 84-118) and is created in the Witness Horizon discrete dynamic simulation program. The resulting model is applied to the example of a specific sequential warehouse serviced by a group of system forklifts. The forklifts carry out the basic manipulations as storage of received pallets into storage positions, unloading and handling of empty pallets from sequential positions and handling of pallets from storage positions to sequential ones. The principle of the model consists in simulating the generation of requirements for storing a received pallet or exchanging an empty pallet for a full one and the processing of those requirements by a forklift. There are also other characteristics of warehouse processes which were taken into account when building the model, e.g. requirement of chaotic storing or fixed process steps. However, by changing the input parameters, it can be used for any other similar warehouse.

*Keywords:* warehouse performance, queuing theory, warehouse management system, dynamic simulation, logistics

## **1 INTRODUCTION**

Given that customer satisfaction is one of the main factors influencing the success of companies across almost all industries, the goal of every company is to increase the quality of its provided services and thus to increase customer satisfaction. One of the factors contributing to this is reducing the time spent waiting for the request to be processed and the efficient method of service, and thus a shorter time spent in the entire system. Mass service theory, or queuing theory, is a field that deals with the modelling, design and management of situations where customers are waiting for their requests to be processed. Within the framework of mass service theory, dependencies between demand inputs and productivity are sought, resp. efficiency of the service system. Subsequently, it is possible to make purposeful changes that will lead to an improvement in the operation of the entire system (Dyntar 2018).

The aim of this paper is to find out effective way how the measure the warehouse performance. It does mean, how many requests it is possible to process during some time. For this purpose, a simulation model is proposed and used for measurement of performance in concrete warehouse.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

The service system is the basic unit of mass service systems. The main feature of these systems is repeatedly arriving requests to perform a certain sequence of operations, and as a rule, these requests arrive completely randomly. The goal of mass service theory is the analysis of existing systems and their optimisation, or the design of an entirely new system (Dorda, Hradil, Mýdlo 2017).

The service system comprises three main entities (Šeda 2011):

- the customer, whom we understand as an entity with a certain requirement,
- a service line that handles customer requests,
- service, which is understood as an activity leading to the fulfilment of the request.

A basic diagram of the mass service system is shown in Figure 1.

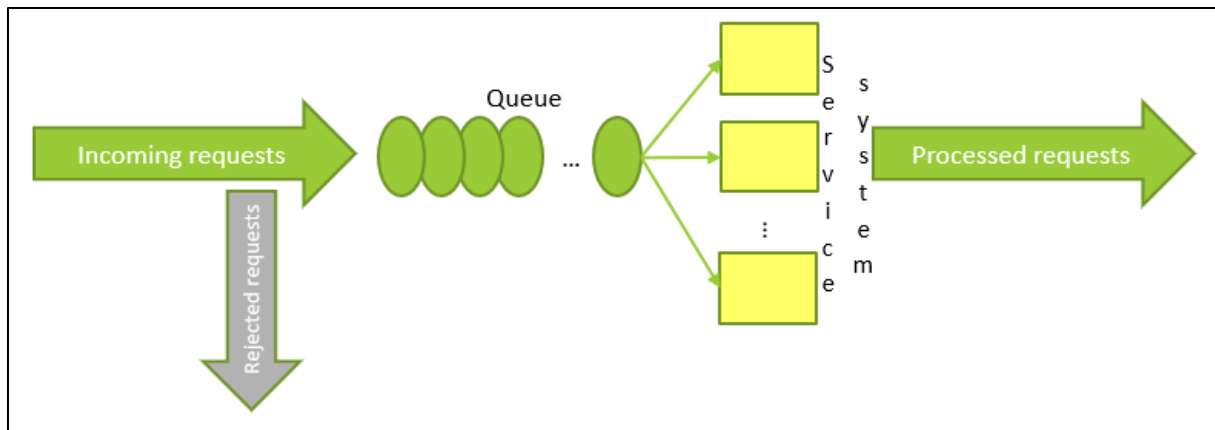


Fig. 1 - Basic diagram of the mass service system. Source: own processing according to Šeda (2011).

The customer or request enters the system and is placed in a queue, or leaves the system for various reasons (incorrect request, dissatisfaction with the length of the queue, etc.). The service system processes requests in a pre-specified queue mode. The service line can be singular, or there can be several. It is necessary to create a resource schedule, determine the sequence of service and specify the movements of mobile resources so that the service line is able to handle customer requests. Handled requests leave the system.

Analytical or simulation methods during designing and optimisation can be used. Analytical methods can be used for small group of processes in the event that the mathematics assumptions are met. One of the most frequently used methods is the Markov chain system. These are stochastic processes with discrete states that have the Markov-feature. This means that the state of the system in the future only depends on the current state, not on the state the system reached in the past (Fačevicová, Hron, Kunderová 2018).

In other cases, simulation models are used. Queuing theory is a discipline where simulation is frequently. Solving complicated optimisation tasks using simulation leads to the creation of a model that contains the elements of the real system and the relationships between them, so that it is possible to model a running of time and follow up individual steps of the process (Dutkova, Achimsky, Drozdziel 2020).

In the available sources, simulation is most often defined as the process of creating a logical-mathematical model of a real process, system or decision-making process and the possibility of implementing a large number of experiments in this model (Dyntar 2018). Dorda et al. (2017) provide additional definitions in his publication, e.g., simulation is a technique that replaces the investigated dynamic system with its model in order to obtain information about the system through an experiment with the model.

Other terms often used include modelling, model and system. Modelling is defined as an experimental process in which a physical or abstract form of the modelled system is created. The result of modelling is a model. By system, it is meant a set of elements and the linkage

between them, which together form a single entity with certain properties (Dorda, Hradil, Mýdlo 2017).

The main advantage of simulation, according to Law and Kelton (1991), is the possibility to choose the right variant, as it is possible to test the proposed variants without physical implementation. Furthermore, the simulation provides a better overview of the variables in the modelled process, their connections with each other, and it further enables easier work with them (Kašparová, Dyntar 2021). Rodrigues, Sirova, Dyntar (2022) also mention a variety of advantages over other operational research approaches, including the capacity to speed up or slow down time to study a system over a longer period of time or to investigate its behaviour more closely.

However, simulation methods also have certain disadvantages, which include the need for special simulation software and a thorough knowledge of working with it. Of course, a good orientation in the modelled process is also necessary. Ignorance of the software or the process, combined with a lack of data, leads to irrelevant outputs, and the benefit from the simulation is only minimal (Dyntar, Strachotova 2015).

Simulations can be divided by several criteria (Dorda, Hradil, Mýdlo 2017):

- according to system continuity:
  - discrete – variables change discontinuously, i.e., by leaps at certain moments in time,
  - continuous – the values of the variables change continuously in the monitored time,
- according to the presence of random variables:
  - deterministic – the values of all variables are precisely defined at every moment and the results of the simulation are the same under the same conditions,
  - stochastic – all or some of the variables have the character of a random variable,
- according to time dependence:
  - static – their output is only defined by inputs, the system is described by a static characteristic that expresses the dependence of the output on the input values,
  - dynamic – the output of the system is not only determined by inputs, but also depends on time,
- according to change capture:
  - with a fixed time step – time-oriented methods,
  - with a variable time step – event-, activity- or process-oriented methods.

Using both analytical and simulation methods, we obtain monitored characteristics such as the workload of the service system, the length of the request queue, the time of the request in the queue, etc., with which we work further.

### **3 METHODOLOGY**

#### **3.1 Modeled system**

The modeled system is a sequential warehouse serviced by a group of system forklift trucks. The diagram of the warehouse is shown in Figure 2.

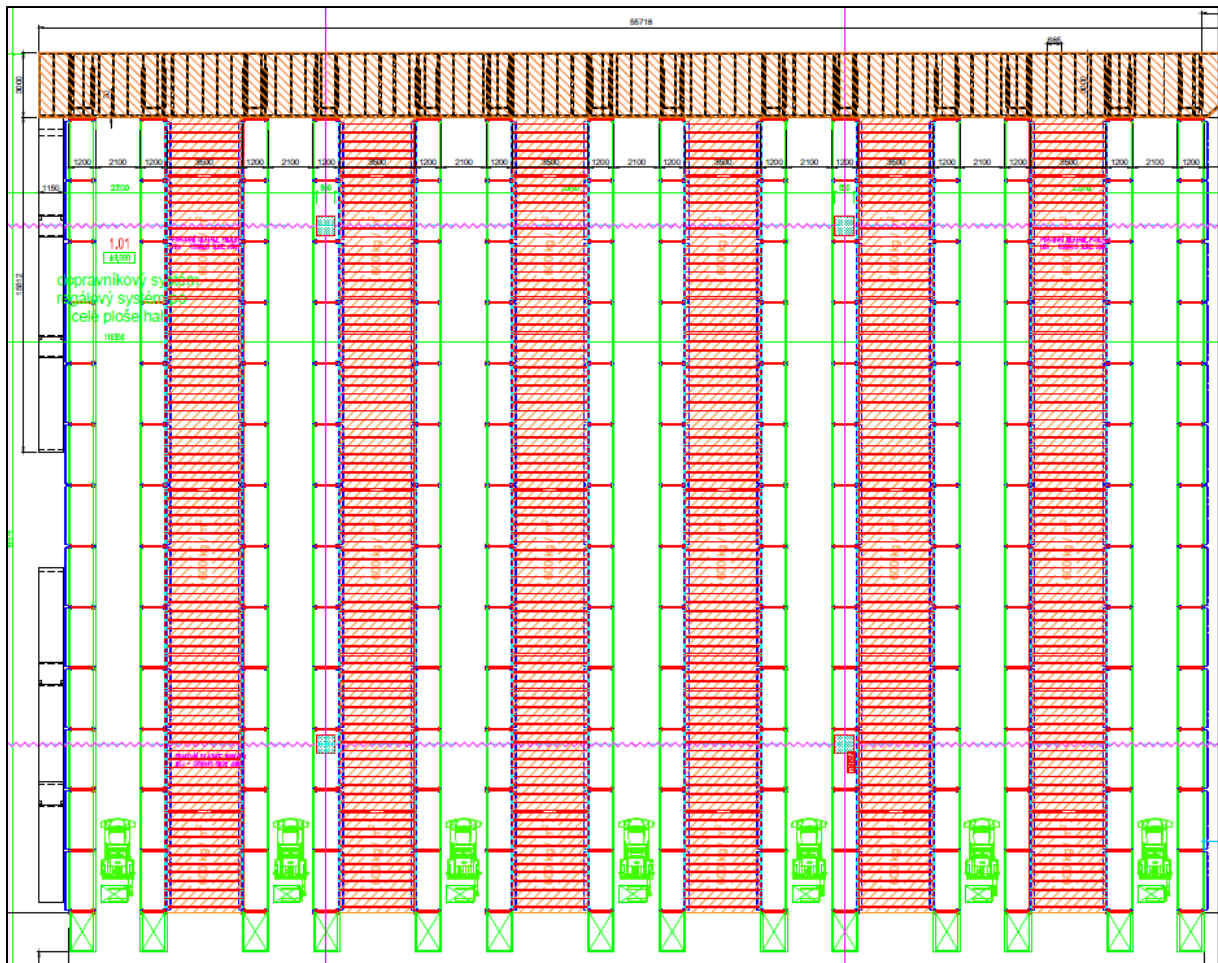


Fig. 2 - Layout of a sequential warehouse. Source: own research.

The warehouse consists of seven aisles, with each aisle operated by one side-loading system forklift. There are two rows of pallet racks in each aisle. The racks are divided into 13 fields and 11 floors, with the 0th floor (ground) reserved for sequential positions. Assuming storage including the top floor, the total capacity of the warehouse is 6 006 pallet positions.

The basic input parameters of the simulation are listed in Table 1.

Tab. 1 - Basic input parameters. Source: own research.

Drive speed of service forklift	3	km.h <sup>-1</sup>
Lift speed of service forklift	13.5	m.min <sup>-1</sup>
Average loading time on handover location	0.42	min.pal <sup>-1</sup>
Stocking to a storage location	0.42	min.pal <sup>-1</sup>
Unloading from a storage location	0.42	min.pal <sup>-1</sup>
Rotating the pallet out of the aisle	0.33	min.pal <sup>-1</sup>

The driving speed is 3 km/h, the lifting speed is 13.5 m/min, and both of these movements can be performed simultaneously. The forklifts carry out the following basic manipulations:

- storage of received pallets into storage positions,

- unloading and handling of empty pallets from sequential positions,
- handling of pallets from storage positions to sequential ones,
- rotating a certain percentage of handled pallets out of the aisle.

There are also some other characteristics of warehouse processes:

- storage is chaotic, i.e., there are no permanent positions in the warehouse,
- handling of an empty pallet from the sequential position and handling of a new pallet from the storage location immediately follow each other in the simulation,
- exchange of an empty pallet with a full one always takes priority before handling the received pallet to a storage position.

### 3.2 The general simulation model of material flows

The structure of the general simulation model of material flows was used to create the model (see Dyntar, (2018), pp. 84-118). This is based on the assumption that any material flow in the supply system can be divided into a finite number of movements, while the realisation of the movement may require the use of some resource and the fulfilment of some conditions (Kašparová, Dyntar, 2020).

Below is a simplified model structure (Figure 3) and a concrete version of the model created in Witness (Figure 4). The description of the elements used, specifications of their properties and links between them follows.

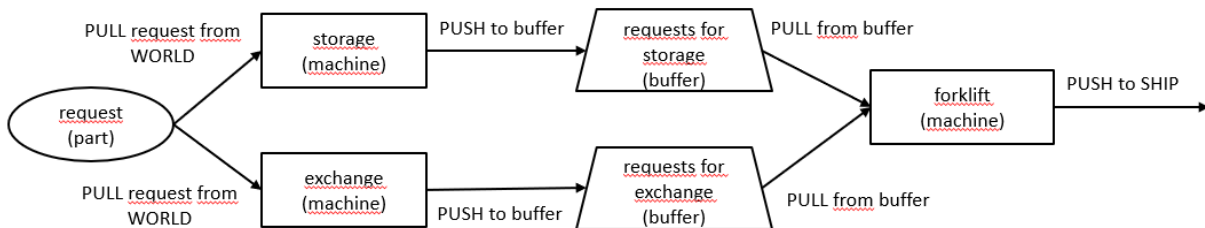


Fig. 3 - A simplified model structure. Source: own research.

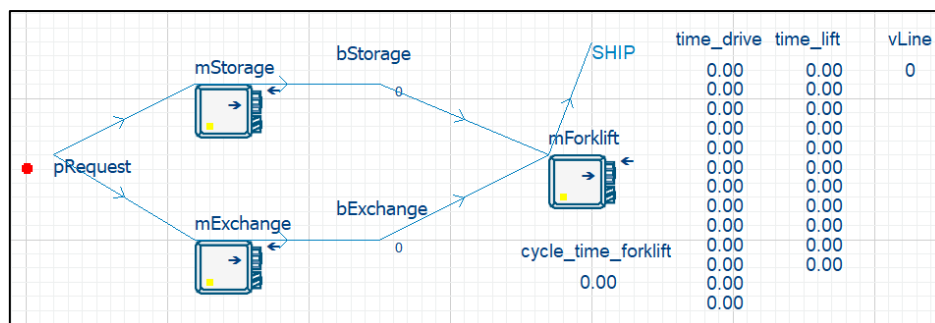


Fig. 4 - Concrete version of the model in Witness. Source: own research.

The following notation is used to describe the model:

- pRequest – element type Part,
- mStorage / mExchange – elements type Machine,
- bStorage / bExchange – elements type Buffer,
- mForklift – element type Machine.

The principle of the model consists in simulating the generation of requirements for storing a received pallet or exchanging an empty pallet for a full one. The next step is the processing of those requirements by a forklift. The basic element pRequest is passive and its generation is registered in the Input Rule field of mStorage and mExchange. At the same time, a concrete type of operation is assigned to pRequest using the Attribute element, which is specified in the Actions on Input fields for mStorage and mExchange. The next movement of pRequest is specified in the Output Rule fields according to the assigned attributes to bStorage and bExchange. These imaginary buffers are used in the simulation to monitor the length of the request queue for individual operations and durations. Cycle time mStorage and mExchange is set as an exponential distribution around the values, see Table 2. Machine mForklift takes pRequest for processing from bStorage and bExchange. The mForklift specification is set in several steps. First, the priority of the exchange of an empty pallet with a full pallet before the storage of a new pallet is set in the Input Rule field. Second, the priority of taking pRequest from bExchange was specified using the IF rule. At the moment when there were no processing requests in the bExchange queue, the mForklift can process the pRequest from the bStorage.

In order to follow the specification of chaotic storage, elements of the Variable type were created to determine the Cycle time:

- variable time\_drive – the time of the forklift drive from the beginning of the rack to the random pallet location were imported using the XLReadArray command from MS Excel, which is entered in Initialise Actions directly in the model specification,
- variable time\_lift – the lift times from the ground to the individual levels of the rack were imported in the same way as variable time\_drive,
- variable cycle\_time\_forklift, which was used to calculate the travel time to a random pallet location; the calculation is entered in the Actions on the Input field for mForklift, see Figure 5.

```

Edit Actions On Input to Cycle 1 For Machine mForklift
Select Search Editor Print
DIM drive AS REAL
DIM lift AS REAL
IF type_of_request = 1
vLine = Uniform (1,13)
drive = time_drive(vLine)
vLine = Uniform (1,11)
lift = time_lift(vLine)
IF drive > lift
cycle_time_forklift = 2 * 0.42 + 2 * drive
ELSE
cycle_time_forklift = 2 * 0.42 + 2 * lift
ENDIF
ELSE
vLine = Uniform (1,13)
drive = time_drive(vLine)
vLine = Uniform (1,11)
lift = time_lift(vLine)
IF drive > lift
cycle_time_forklift = 4 * 0.42 + 5 * drive
ELSE
cycle_time_forklift = 4 * 0.42 + 5 * lift
ENDIF
IF Random () < 0
cycle_time_forklift = cycle_time_forklift + 0.33
ENDIF
ENDIF

```

Fig. 5 - Calculation of drive- and/or lift-time. Source: own research.

The basic idea of this calculation is that if the mForklift is processing any pRequest of storage the type of a new pallet, it performs 2 manipulations and 2 drives. The handling time is known and the driving time is randomly selected from the variables time\_drive or time\_lift (depends on which of those random numbers is higher). In the other case, if the mForklift is processing a pRequest of the empty pallet for a full pallet exchange type in a sequential position, it performs 4 manipulations and 5 drives, and thus it is treated so that the restocking of a full pallet into a sequential position is done immediately after the removal of an empty pallet. In the Actions on Input field, the requirement to rotate a certain percentage of pallets out of the aisle was also taken into account. The result of the variable cycle\_time\_forklift was then assigned into the Cycle Time field.

The simulation model was created in the Witness Horizon environment with the support of MS Excel 2019 for import of inputs. The simulations were performed on a computer with an Intel Core i5 8250U 1.6 GHz/3.4 GHz processor, 8 GB DDR4 RAM.

## 4 RESULTS

Simulations were performed to determine the capacity and performance of the warehouse with the element parameters set in this way. The simulation was started for the equivalent of 100 days of operation, i.e., with an available time fund of 22.5 hours/day, it was started for 135,000 minutes. The performance of the warehouse is shown in pallets, whereby the amount of 1 pallet represents the processing of 1 storage request and 1 request to exchange a full pallet for an empty one so that the balance of the warehouse over time is balanced. The simulation results are presented in Table 2, and in more detail in the graphs in Figures 6 - 8.

Tab. 2 - Simulation results. Source: own research.

Proportion of rotated pallets	Cycle time of mZaskladnění / mVýměna	No. of operations /day	Warehouse performance [pal. h-1]	Forklift utilisation [%]	Av. Time of storage [min]	Max. queue for storage [pal]	Av. queue for storage [pal]	Av. Time of exchange [min]	Max. queue for exchange [pal]	Av. queue for exchange [pal]
0%	NegExp (7.41)	1,273	57	91.93	56.49	52	7.62	5.22	12	0.70
25%	NegExp (7.49)	1,259	56	91.94	56.39	52	7.52	5.34	12	0.71
50%	NegExp (7.61)	1,240	55	91.66	57.03	53	7.49	5.41	13	0.71
75%	NegExp (7.71)	1,223	54	91.57	59.34	65	7.69	5.57	13	0.72
100%	NegExp (7.78)	1,211	54	91.63	60.05	53	7.71	5.62	13	0.72

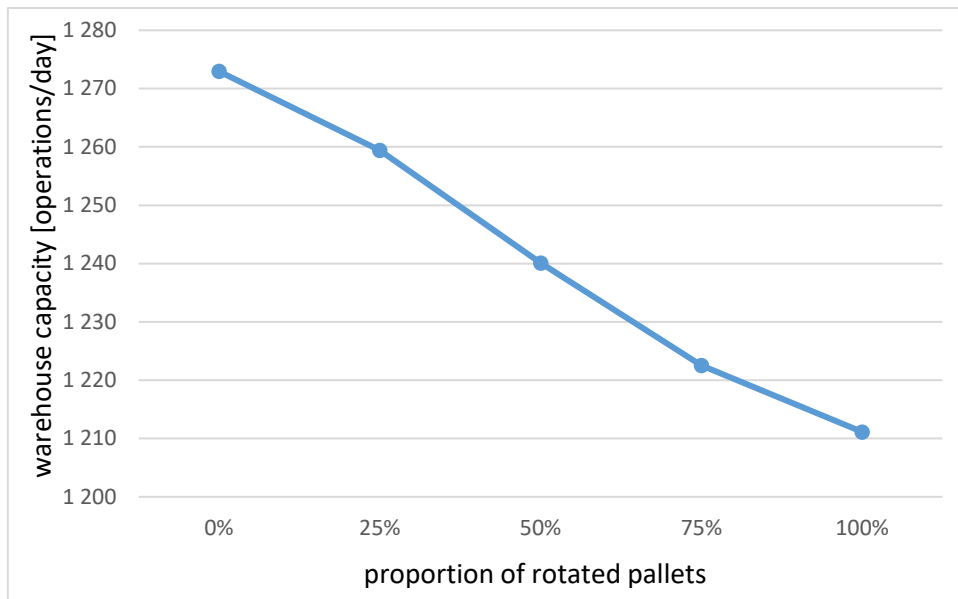


Fig. 6 - Warehouse capacity. Source: own research.

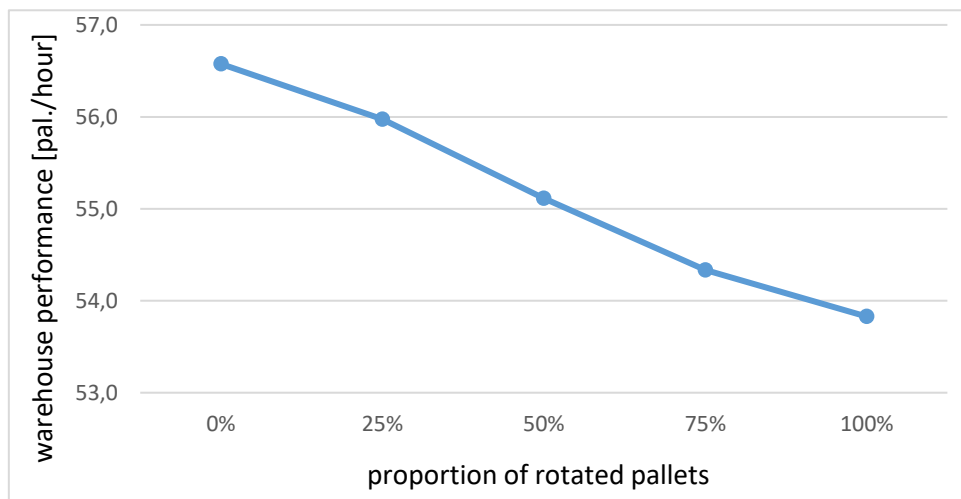


Fig. 7 - Warehouse performance. Source: own research.

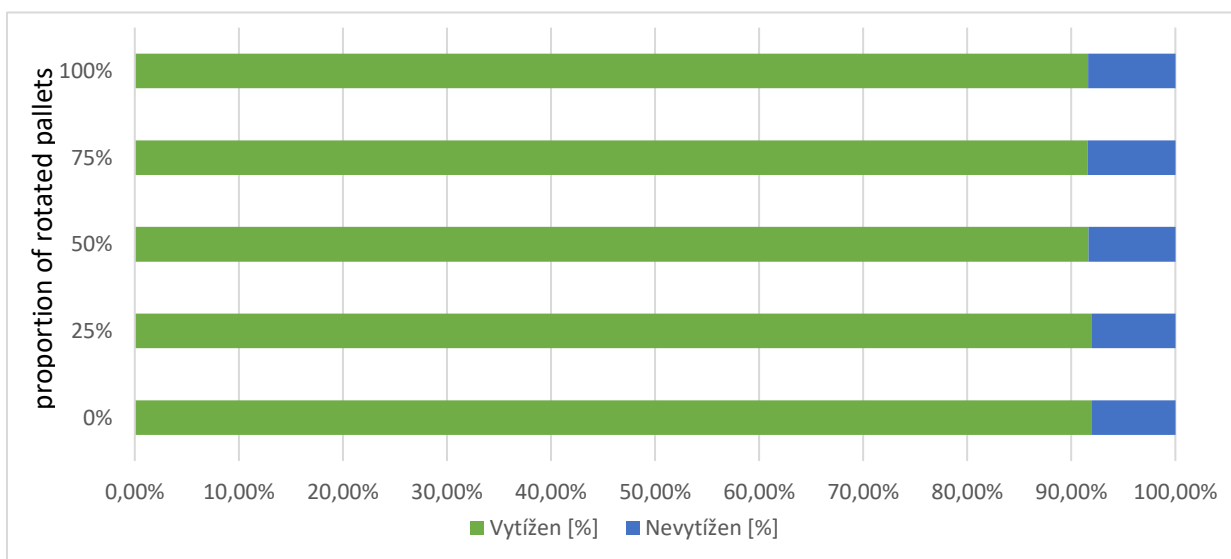


Fig. 8 - Use of forklifts. Source: own research.



The simulation results show that the performance of the warehouse slightly decreases with an increasing proportion of rotated pallets. At the same time the utilisation of the forklifts is still at the limit of 92%. In case no pallet is rotated out of an aisle, the attained capacity is 1,273 processed requests per day, respectively, the capacity of the warehouse is 57 pallets per hour. Vice versa, if it is necessary to rotate all the pallets, the output decreases to 54 pallets per hour and the warehouse capacity in this case is 1,211 processed requests per day.

As seen in Table 1, the Cycle time of machines simulating the creation of a request for storage or pallet exchange is set as an exponential distribution with a mean value in the interval (7.40 min; 7.80 min).

The experiments carried out in the model also showed that if we want to increase the performance of the warehouse and the utilisation of the forklifts, we can achieve this by shortening the cycle time of mZaskladnění / mVýměna. However, this step also leads to the accumulation of requests waiting for storage and the extension of the average processing time of both types of requests, which is not desirable.

## 5 DISCUSSION

The proposed model provides the required information about warehouse performance and other associated characteristics.

From the perspective of determining warehouse performance, the proposed model brings the following advantages thanks to the selected modelling technique:

- By adding additional movements, the modelled system can be expanded to include other material flows and process steps, such as delivery completeness control at goods receipt, quality control before storage, etc., and thus obtain a comprehensive material flow through the logistics system.
- The minimum number of physical elements shortens the simulation time and, therefore, a large number of experiments can be performed in a relatively short time, which will not only provide information about the performance of the warehouse, but also relay other information such as data for planning the need for resources for a given process.
- By simple changing the parameters of individual elements, it is possible to simulate changes that will lead to higher warehouse performance, such as using of more powerful forklifts or reducing the time required for system execution of operations.
- Due to the simplicity of the model, it can also be transferred to other simulation software.

## 6 CONCLUSION

For the simulation of logistics processes, it is necessary to choose a suitable method and solution procedure, where the most important thing is enough correct input data. Only then can we carry out a high-quality simulation of the existing or projected process, find bottlenecks and calculate possible economics savings.

The outputs of the model can be used to discuss the possibilities of using simulation for planning, scheduling, and operational control in different industries and to compare the advantages and disadvantages of the proposed solution with methods of mathematical methods.

Furthermore, outputs of simulation provide the companies with the possibility to select optimal solution before investment.

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# THE IMPACT OF THE COVID-19 PANDEMIC ON PRE-CHRISTMAS SHOPPING BEHAVIOR

*Michal Jankovič*

## **Abstract**

One of the most significant changes that can be observed at a time of global crisis caused by the COVID-19 pandemic in all countries of the world is the transfer of large volumes of household purchases to the electronic environment. Based on the implementation of the primary survey, the main objective of the paper is to identify the main changes in consumer behaviour when buying Christmas gifts in 2020 during the COVID-19 pandemic. Based on the results of the primary survey, it is possible to identify the main factors influencing the purchase of Christmas gifts by Slovak consumers, as well as to point out changes in the ratio of the frequency of purchase in brick-and-mortar stores and on e-shops. A number of studies also show that these digital habits and the increase in consumer preferences and affection for e-shopping will continue beyond the end of the COVID-19 crisis, which should be prepared not only for consumers, but also for all businesses.

*Keywords:* Consumer behaviour, Covid-19, E-commerce.

## **1 INTRODUCTION**

At a time of economic uncertainty caused by the COVID-19 pandemic that is prevalent in all countries of the world, rapid changes can be observed in several sectors of global economies. One of the most significant changes is also the transfer of large volumes of household purchases to the electronic environment, which can be considered as the primary source of income of most businesses during the pandemic. Household behavior is changing in several ways, whether we are talking about excessive accumulation and storage of stocks, inconsistencies between supply and demand in the market, or the growing trend of preference for online purchases, which is influenced by several new factors that have not previously played an important role for consumers. This was also the case in the pre-Christmas period, in which household consumption increases annually, the frequency of purchases, whether in brick-and-mortar stores or through online shops, and naturally the volumes of customers' shopping baskets are also increasing.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

Survival psychology says individuals may be subject to behavioral changes due to specific events, including natural disasters, health crises and terrorist attacks (Forbes 2017). These behavioral changes may include negative occurrences of crowd mentality, panic buying, changes in shopping habits and changes in investment decision-making. Furthermore, in addition to SARS, in the absence of extensively researched modern pandemics, which have been relatively localized during their existence, COVID-19 research will be crucial for understanding and possibly anticipating the future of shock and crisis research. We commonly refer to the term panic purchase as behavior manifested by consumers and by purchasing unusually large quantities of goods or an unusually diverse range of products in the expectation that there will be a large price increase during or after a disaster, or there will be a shortage of goods on the market for the same reasons (Yoon et al. 2020). In the context of the specific consumer behavior caused by supply shortages and supply chain difficulties, which has been

repeatedly reflected worldwide, the question arises, in the context of the COVID-19 pandemic, as to whether we can better prepare consumers for similar situations in order to avoid such behavior in the event of future crises. The herd mentality is defined as the alignment of ideas or behaviors of individuals in a group that arise without purposeful coordination by a central authority or a leading figure and are instead created through local interactions between consumers (Kameda and Hastie 2015). In times of crises or shocks, such as covid-19, the crowd mentality manifests itself in several different key areas, including stock prices, consumer purchasing behavior and collective social anxiety. A key problem raised by the crowd mentality is that it creates incorrect allocations of assets and therefore prices in the economies, because consumers are rushing to make specific purchases where supply cannot be increased quickly and sufficiently, or when volatility prevails in stock markets.

According to a Deloitte study, nearly four in 10 U.S. consumers (38%) also planned to spend less money on gifts on Christmas 2020. The main reasons for the increased caution of respondents were related to economic instability (50%) and their plans to save more (40%) (Deloitte 2020). Travel and experiences were the items that American consumers restricted the most in this festive period. Up to 34% planned to invest less in socialization away from home compared to 2019. The most popular gift for 2020 were gift vouchers (48%), followed by clothes (43%) and games and toys (40%). On the other side were jewelry, pet toys, decorations, and accessories (24%), which found themselves on the tail of gifts for 2020. As the restrictions imposed in the context of the global health crisis during the Christmas holidays were tightened, the first two items respondents would buy for themselves during the season were popular drinks (33%) and food (30%). Whether they shopped for others or for themselves, consumers preferred to shop online because they avoided crowds (65%), more conveniently bought from home (64%) and could also benefit from free transportation (60%). Half of consumers (51%) were concerned about in-store shopping during the holidays due to COVID-19, and 49% of them said they would resume their pre-COVID-19 shopping behavior only when a vaccine was developed. In addition to this preference for online shopping, consumers preferred convenience, as 69% of respondents said they preferred shops closer to their home.

According to the latest research of Australian consumers by Monash Business School in a year unmarked by the crisis, most shoppers usually start their Christmas shopping within three months of Christmas (85%), with most shopping in the last four weeks before Christmas (47%). Although many shoppers expect to make Christmas shopping at roughly the same time (68%), a fifth of them started earlier than usual in 2020 (20%). Due to COVID-19, these buyers believe that the supply will be lower than usual and expect longer delivery times than usual, while some buyers want to leave more time for planning this year (Atto 2020). For buyers in Australia, this year has changed not only the timing of Christmas purchases, but also the number or volume of what they plan to buy for friends and families, as well as the individual products they want to buy. Many Australians who buy gifts for family and friends expect to shop for their immediate family (24%), other relatives (23%) and friends (24%) less than in 2019. Moreover, 2020, coupled with the COVID-19 pandemic, has affected jobs in Australia, and has also had a significant impact on the decline in household incomes, with customers expecting to be more conservative with their spending (58%) seeking discounts or special offers (60%).

### **3 METHODOLOGY**

Based on the implementation of the primary survey, the main objective of the paper is to identify the main changes in consumer behaviour when buying Christmas gifts in 2021 during the COVID-19 pandemic. Based on the scientific method of analysis, synthesis, and deduction, it was possible to process secondary data from professional literature in the form of book

publications and online sources published on the Internet. After theoretical processing of the subject, the collection of primary data was carried out through the CAWI online questionnaire. The survey included questions divided into two sections on the purchase of Christmas gifts before the outbreak of the pandemic and during the COVID-19 pandemic. The survey was conducted between 07.01.2022 and 20.01.2022 and was attended by a total of 587 respondents. Young people aged between 16 and 32 were chosen as the target segment, whose detailed demographic variables are listed in tab. 1:

Tab. 1 – Demographic variables of respondents. Source: own research

<b>Sex:</b>		<b>Region from which respondents come:</b>		<b>Type of place where respondents live:</b>	
<b>Woman</b>	84%	<b>Bratislava region</b>	17,4%	<b>Town</b>	56%
<b>Man</b>	16%	<b>Trnava Region</b>	9%	<b>Village</b>	44%
		<b>Trenčín Region</b>	10,4%		
		<b>Nitra Region</b>	12,4%		
		<b>Banská Bystrica Region</b>	9,4%		
		<b>Žilina Region</b>	16,5%		
		<b>Prešov region</b>	13,6%		
		<b>Košice Region</b>	11,2%		

The results of the primary survey were processed in the SPSS statistical programme, and the data obtained could be analysed in detail through pivottables and the Chi-Quadrate of the Good Match Test . The results of the survey should provide answers to the followinghypothesis and research questions:

*H1: There is a direct dependency between the type of place where respondents live and the preference for buying Christmas gifts over the Internet.*

*RQ1: Which factors influence the purchase of Christmas gifts during the COVID-19 pandemic?*

*RQ2: What are the changes in the proportions of buying Christmas gifts in brick-and-mortar stores and e-shops during the COVID-19 pandemic?*

## 4 RESULTS

The main objective of the paper was to identify the main changes in the purchasing behaviour of Slovak consumers, the primary step was to identify the main aspects that can influence the shopping baskets of Slovaks in the pre-Christmas period. Factors, which influenced Slovak consumers the most when buying gifts for Christmas in 2020, can be seen in Graph 1. The pre-Christmas period of 2021 was significantly influenced by restrictions on the movement of residents, restrictions on the part of the government, or fear of endangering the health of themselves and their loved ones. All this can be considered as reasons that have also had a significant impact on Christmas gift shopping. Availability in stock and delivery time, which more than half of respondents identified as very important, can be considered the most dominant factor. The third most important factor was the price of the product, which was identified by 57.2% of respondents. The smallest commitment to buying Christmas gifts can be observed in environmental protection, as the ecological side was identified by up to 62% of respondents as a factor that does not affect them at all or affects less.

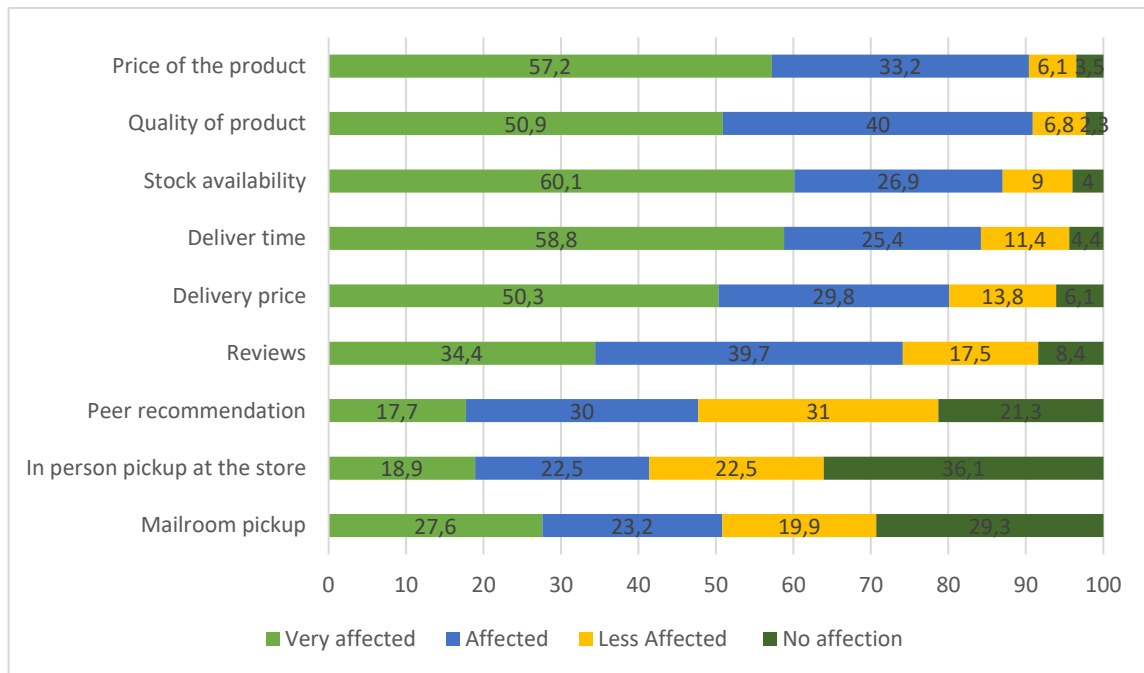


Fig. 1 – Factors influencing the purchasing behaviour of Slovak consumers when buying Christmas gifts (in %).

Source: own research

The survey also included a question about factors affecting consumers when buying non-Christmas goods before and after the outbreak of the pandemic. On this issue, consumers chose the price and quality of the product, the price of product delivery and reviews on the Internet as the most important factor before the pandemic. During the pandemic period, the answers were almost identical, the first two places belonged to the price – namely the price of the product and the price for delivery of the goods, followed by the quality of the product and the availability of the goods in stock. From the following results it can be concluded that when buying Christmas gifts, Slovak consumers consider the price of the product to be a less important factor, paying particular attention to the speed of delivery of these goods, so that they have it available as soon as possible. Part of the survey was also a comparison of the frequency of purchase of Slovak consumers in brick-and-mortar stores and e-shops, while again we focused primarily on the pre-Christmas period, in which consumers buy mostly Christmas gifts.

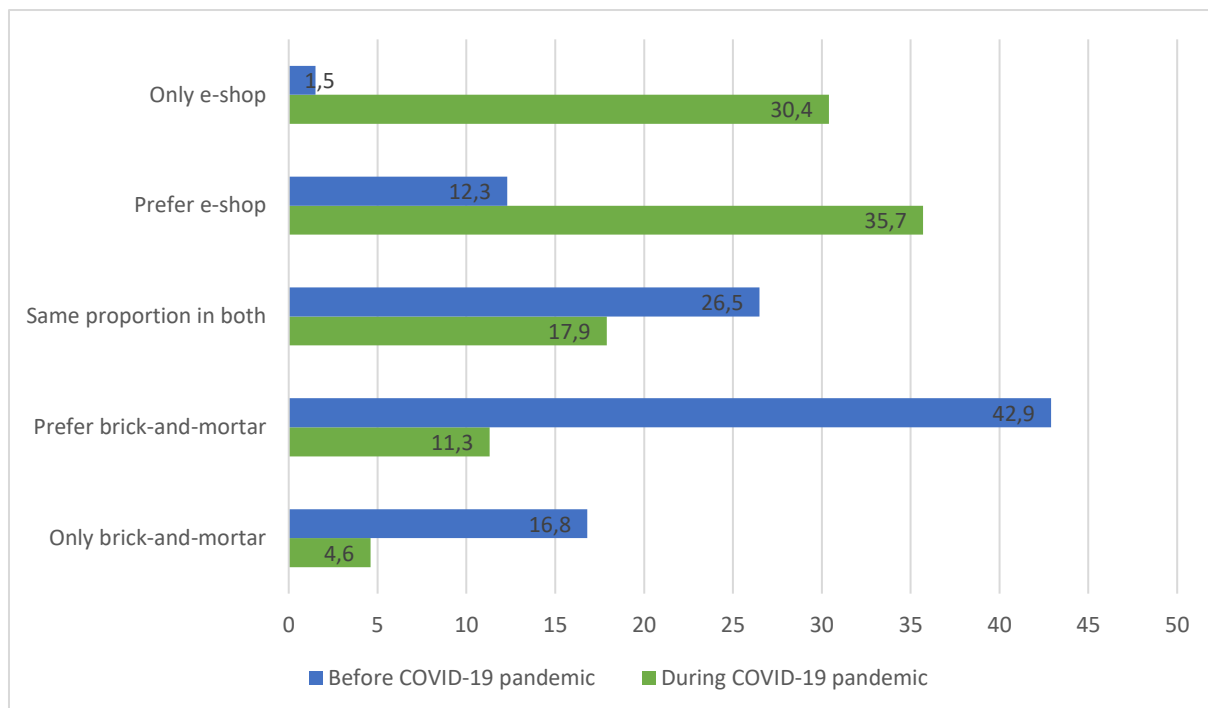


Fig. 2 – Comparison of the frequency of purchase of Slovak consumers in brick-and-mortar stores and e-shops during and before the pandemic (in %). Source: own research

Figure 2 shows a comparison of the frequency of purchase of Slovak consumers in proportion to brick-and-mortar stores and e-shops in the two periods studied – before the pandemic and during the COVID-19 pandemic. While up to 16.8% of respondents preferred to buy only in brick-and-mortar stores before the pandemic, and up to 42.9% said they were buying more in brick-and-mortar stores than on e-shops, we can see huge changes after the COVID-19 outbreak. At the time of the COVID-19 pandemic, up to 30.4% of respondents indicated that they only bought Christmas gifts on e-shops, representing a 29% increase from previous years. At the time of the pandemic, 11.3% of respondents were shopping exclusively in brick-and-mortar stores, representing a decrease of 31%. Again, these responses may be largely influenced by restrictions on the limited operation of individual shops or population mobility. However, changes in preferences for online shopping concern not only Christmas gifts, but also purchases in general. Before the outbreak of the pandemic, 17.7% of respondents were shopping from foreign e-shops, while during the pandemic this percentage fell to 11%. According to several studies, these digital habits can be expected to persist in individual countries for much longer than the fight against the COVID-19 pandemic (Puttaiah, 2020). The online survey by KMPG also confirms and complements the data of our survey, as the results show that e-commerce has increased in several segments, with a significant decrease observed precisely in purchases in standard locations where a physical customer presence is needed (almost a 40% decrease in the food segment) (KMPG, 2020).

Paper also includes an assessment of the dependency between the place where respondents live and the frequency of online purchases. We assumed that respondents who live in less developed regions, from which due to the lack of supply of goods need to travel for the purchase of Christmas presents, would prefer to buy online. The results are shown in Table 2 and Table 3.

Tab. 2 – Pivot table. Source: own research

			I live:		Total	
			in the village	in the city		
When buying gifts in the pre-Christmas period, at the time of the pandemic, I shopped:	Only on e-shops	Count	85	92	177	
		Expected Count	77,7	99,3	177,0	
	Only in brick-and-mortar stores	Count	15	12	27	
		Expected Count	11,9	15,1	27,0	
	In the same proportion between the e-shop and the brick-and-mortar store	Count	33	71	104	
		Expected Count	45,6	58,4	104,0	
	More gifts on the e-shop and less in brick-and-mortar stores (shopping centers)	Count	98	110	208	
		Expected Count	91,3	116,7	208,0	
	More in brick-and-mortar stores and less on e-shops	Count	24	41	65	
		Expected Count	28,5	36,5	65,0	
	Total		Count	255	326	581
			Expected Count	255,0	326,0	581,0

Tab. 3 – Chi-Square Test of Independence. Source: own research

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11,123 <sup>a</sup>	4	0,025
Likelihood Ratio	11,315	4	0,023
N of Valid Cases	581		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 11,85.

The basic chi-square condition of the test is met and neither cell contains a value of less than 5, which means that there is a dependency between the variables. We reject the null hypothesis and accept the alternative hypothesis 1, which conducts of the fact that it detects a direct dependence between the type of place in which respondents live (in the city-village ratio) and the preference for buying Christmas gifts over the Internet.



## 5 CONCLUSION

Based on the implementation of the primary survey, the main objective of the paper was to identify the main changes in consumer behaviour when buying Christmas gifts in 2021 during the COVID-19 pandemic. Based on the results of the primary survey of 587 respondents living in Slovakia, we can conclude that the primary factors considered by respondents to be the most important when buying Christmas gifts are the availability of goods in stock and the time of delivery of these goods directly to the final customer. These factors differ from those considered by consumers to be the most important in connection with the purchase of non-Christmas goods, where they rank among the primary factors price and quality of the goods. Based on the results, it is therefore possible to draw partial conclusions that the Slovak consumers prefer the timeliness and accuracy of the delivery of the goods purchased for the purpose of a Christmas gift to the actual price of these goods. Interesting results could also be observed when comparing the frequency of buying Christmas gifts over the Internet and in brick-and-mortar stores. The survey consisted of identical scaling question concerning the two periods examined – the period before and after the outbreak of the pandemic. Due to respondents' responses, it was possible to observe an up to 31% decline in preferences for buying Christmas gifts in brick-and-mortar stores before e-shops, and at the same time a 29% increase in preferences of e-shops over purchases in shopping centres and brick-and-mortar stores, where the customer's personal presence is strictly necessary. A number of studies also show that these digital habits and the increase in consumer preferences and affection for e-shopping will last much longer than the fight against the COVID-19 pandemic, which should be prepared not only for consumers, but also for all businesses.

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# RELATIONSHIP BETWEEN SPORTS PARTICIPATION AND ENGAGEMENT IN ENTREPRENEURSHIP AMONG UNIVERSITY STUDENTS

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## **Abstract**

Sport and entrepreneurship have a lot in common, and the similarities between them are particularly evident in the development of the individual personality of the athlete and the entrepreneur. These two fields develop and cultivate similar personal attributes, often making athletes inclined towards entrepreneurship and equipped with qualities applicable in the entrepreneurial field. The research presented in our paper builds on the international GUESSS: Global University Entrepreneurial Spirit Students' Survey project, the world's largest academic study on student entrepreneurship, using its data collected in 2021 in Slovakia. The main objective of the presented paper is to investigate the relationship between involvement in sport and engagement in entrepreneurship, entrepreneurial intentions, and the development of entrepreneurial capabilities. Therefore, for the research, we used the quantitative data collected in a questionnaire survey among 5754 business and non-business university students across the country. The study focuses on the intensity of students' involvement in sport and entrepreneurial activity, their intentions to start a business, and their perceived level of entrepreneurial capabilities. We subjected the collected material to descriptive statistics methods and other statistical analyses to explore the potential relationships between the analysed domains. Our results suggest that entrepreneurial intention and perception of own entrepreneurial competencies within the student population are positively related to regular participation in sports activity.

*Keywords: business, education, entrepreneurship, GUESSS, sport*

## **1 INTRODUCTION**

Sport develops and strengthens the personality and exposes the athlete to extraordinary efforts in extreme conditions. We can see the weakest and strongest sides of their characters through training and competing. The most significant value of sport is that it shows both the strengths and weaknesses of an athlete's physical abilities and mental strength and stability. Athletes are not inherently mentally stronger than others. It is all about how the individual deals with their weaknesses or not and uses that knowledge to develop and enhance their best potential. As mentioned in our recent research, sport and entrepreneurship have much in common. The similarities between them are embodied particularly in the individual personality of the athlete and the entrepreneur. The two fields develop and cultivate similar individual characteristics that make athletes susceptible to entrepreneurship and equip them with qualities applicable in the entrepreneurial field (Karlík et al., 2021). The article above was based on data from the international project ENDURANCE: Entrepreneurial Capacity-building for Sport (co-financed by the Erasmus+ program of the EC), which aims to use the links between sports and entrepreneurship to reignite entrepreneurial spirit. To extend the research in this area, we decided to conduct a follow-up study based on different and more extensive data. Namely, we used the data collected in Slovakia within the GUESSS (Global University Entrepreneurial Spirit Student's Survey) international research project aimed at student entrepreneurship. The data collection in the form of a survey was conducted in 2021, and 5754 responses were collected from students studying at Slovak universities. In addition to standard GUESSS

questions, the respondents were inquired about their past and current sports participation. Our paper examines the relationship between sports participation and engagement in entrepreneurship among university students.

The structure of the presented paper is as follows: Section 2 offers a review of academic literature on common characteristics between sport and entrepreneurship and the attributes developed through sport that are useful for entrepreneurship. Next, section 3 explains the data and methods of the research presented in this paper, while section 4 introduces its findings. Then, section 5 discusses the main findings and their implications, and section 6 concludes.

## **2 LITERATURE REVIEW**

Sport has been the most popular recreational activity, and an important element of society for centuries. The entrepreneurial potential has also been embedded in societies for ages, helping people to grow socially and economically. A link between sports participation and new venture creation among the young population could become a valuable contribution to the entrepreneurship literature, which is why we chose this topic as the subject of our research. Undertaking activities that focus on goal-orientedness and diligence at a young age can significantly influence entrepreneurial inclinations later in life (Baltes et al., 2006; Falck et al., 2012; Obschonka et al., 2013; Zhang & Arvey, 2009). Competitive sports are an excellent means of teaching youth to become effective participants in society and to develop skills and traits useful in future entrepreneurial activities (Pervun et al., 2022). As a such, sport, whether an individual or a team sport, can shape people differently and motivate them to become entrepreneurs. For example, athletes engaged in individual sports, compared to team athletes, may receive more individual attention from coaches (Ericsson, 1996)(Ericsson, 2006)(Ericsson, 2020) and may have a deeper sense of responsibility for the results of their performance. At the same time, as business creation is often a team effort, athletes involved in team sports may naturally develop collaborative and team-building skills that make them better prepared for entrepreneurship. We focus on sports participation among university students in their young age, as sports play an important role in shaping young people mentally and physically – through the development of positive traits, skills, character, identity, and physiological capacity (Pervun et al., 2022). Therefore, within entrepreneurship, we focus on personality dimensions such as persistence, resilience, self-efficacy, and other traits that cause individuals to respond to certain situations in a predetermined way (Rauch & Frese, 2007; Zhao & Seibert, 2006). An uncertain and ever-changing environment is typical for both entrepreneurs and athletes, who often have to make decisions at a given moment with incomplete information in fractions of a second. Thus, resilience results from the interaction between entrepreneurs or athletes and their environment (Ayala & Manzano, 2014). For athletes, entrepreneurial activity during and after their sporting years can be seen as a natural development (Goxe & Viala, 2010; Pidduck et al., 2020; Ratten, 2015, 2018; Wang et al., 2021). An athlete's abilities, cognitive resources, and skills acquired through sport are transferable to later stages of life and have important implications for post-sport professional endeavours (Allen & Laborde, 2014). Athletes score higher on several positive personality traits such as achievement motivation, positivity, self-belief, self-esteem, psychological resilience, and perseverance (Cox, 2012; Guillén & Laborde, 2014; Laborde et al., 2016; Weinberg & Gould, 2019). Through participation in competitive sports, athletes develop personality traits such as endurance, positivity, resilience, self-esteem, and self-efficacy (Laborde et al., 2016; Weinberg & Gould, 2019). Self-efficacy is a part of an individual's emotional capital as it enables them to control themselves and reach life goals. This confidence is important in the business world as individuals compete for new sources of ideas and innovation. Part of the athletes' confidence is also sourced in their cognitive capabilities due to behavioral training (Karlík et al., 2021). Also, sportspeople are characterized by a higher

locus of control, situational control, need for achievement, resilience, and discipline than the average person. These traits are related to higher entrepreneurial orientation and intentions (Pellegrini et al., 2020). Individuals who engage in years of deliberate training through sport acquire better perceptual skills that enable them to better sort and process information (Baron & Ensley, 2006). Further, those who practiced sport as young children usually grew up in competitive social contexts capable of generating the skills necessary for entrepreneurship (Pellegrini et al., 2020). Also, based on their experience in sports, athletes develop opportunity recognition ability, which is a key entrepreneurial trait (Luthans et al., 2006). In terms of opportunity discovery (Renko et al., 2012), this skill is crucial in understanding the environmental context in the opportunity recognition phase of the entrepreneurial process (Baron & Henry, 2010) and also in distinguishing profitable business opportunities from unprofitable ones (Smith et al., 2009). Playing sport also assists in identifying and acquiring the specific resources needed to exploit opportunities (Baron & Henry, 2010). In addition, according to Brinckmann and Kim (2015), psychological resilience and persistence positively affect planning and resource acquisition. There is also a positive relationship between persistence and resource acquisition (Baum & Locke, 2004).

Based on the review of the literature presented above, we assume that regular sports participation is related to university students' propensity towards entrepreneurship. Thus, we aim to empirically explore this relationship in the presented paper.

### **3 METHODOLOGY**

Our paper is based on the data from the Global University Entrepreneurial Spirit Students' Survey (GUESSS) research project, the world's largest academic study on student entrepreneurship, collected in 2021 in Slovakia. Besides the standard GUESSS items, the survey instrument in Slovakia contained several additional questions on students' sports participation, which allowed for a combined analysis of the two domains – entrepreneurship and sport. The sample comprised 5 754 students of Slovak universities (3813 female, 1920 male respondents, 21 respondents did not indicate their gender or indicated another gender; average age 23.61 years). Out of this sample, 5 727 individuals answered the questions about sports participation, representing the primary sample for our study.

In our analysis, we employed the standard GUESSS variables based on the questionnaire items inquiring about respondents' involvement in nascent (currently trying to start their own business or to become self-employed) or active (already running their own business or being self-employed) entrepreneurship; their entrepreneurial intention (based on the EIQ by Linan and Chen (2009), six items, Likert-type scale from 1 to 7); and their self-perception of own entrepreneurial capabilities (7 items: opportunity identification, new product creation, innovation management, leadership and communication, professional networking, commercialization, and business management; Likert-type scale from 1 to 7). The sports participation was measured based on the questionnaire item asking respondents about the current intensity of their sports activity, reclassified into three categories: regular sports activity (both competitive and recreational), occasional sports activity, and no sports activity.

To explore the relationship between sports participation and engagement in entrepreneurship among university students, we have used the nonparametric Kruskal-Wallis test (due to the non-normal distribution of our data) to compare multiple independent samples (i.e., the intensity categories of sports participation) in values of continuous quantitative variables, and Chi-Square test to compare independent populations (i.e., the intensity categories of sports participation) in values of categorical variables. The analysis was executed in IBM SPSS v.28 package.

## 4 RESULTS AND DISCUSSION

Before the actual analysis, we had an initial look at the intensity of sports participation in our sample of university students in Slovakia (Table 1 below).

Tab. 1 - Sports participation among university students. Source: own research

		Frequency	Percent	Valid Percent	Cumulative Percent
Sports participation	Regularly	2944	51,2	51,4	51,4
	Occasionally	1958	34	34,2	85,6
	Not at all	825	14,3	14,4	100
	Total	5727	99,5	100	
Missing	System	27	0,5		
Total		5754	100		

As seen from the results presented above, slightly more than half of university students in our sample practice sport regularly. Next, around one-third of our student sample indicated their sports activity as occasional, and only 14.4 % of the student respondents answered that they do not conduct any sport at all.

In the first step of our analysis, we analyzed the relationship between the intensity of sports participation and students' involvement in nascent or active entrepreneurship (Tables 2 and 3 below).

Tab. 2 - Students' sports participation and nascent entrepreneurship. Source: own research

			Sports participation			Total	Chi-square (p-value)
			Regularly	Occasionally	Not at all		
Are you currently trying to start your own business / to become self-employed?	No	Count	2313	1650	675	4638	25,271 (<,001)
		% within Sports participation	78,60%	84,30%	81,80%	81,00%	
	Yes	Count	631	308	150	1089	
		% within Sports participation	21,40%	15,70%	18,20%	19,00%	
Total	Count	2944	1958	825	5727		
	% within Sports participation	100,00%	100,00%	100,00%	100,00%		

As shown in table 2 above, results indicate that 21.4% of those who play sports regularly are currently involved in setting up their business, compared to non-sportsmen students whose engagement in nascent entrepreneurship was 18.2%. Interestingly, the lowest rate of nascent

entrepreneurship was found in the case of university students who practice sports occasionally. We also subjected the results for this question to a statistical chi-square test. Based on the chi square test we can say that this is a statistically significant difference that is not random.

From this, we can conclude that, as a sporting activity or the intensity of involvement in sports increases, the engagement in setting up a business also increases. There are several similar attributes that emerge in sporting activity as in entrepreneurship as mentioned in the theoretical section. Therefore involvement in sport can be seen as an activity that can have a positive impact on involvement in entrepreneurship. Higher involvement in nascent entrepreneurship is particularly evident in individuals who play sports regularly.

Tab. 3 - Students’ sports participation and active entrepreneurship. Source: own research

			Sports participation			Total	Chi-square (p-value)
			Regularly	Occasionally	Not at all		
Are you already running your own business / are you already self-employed?	No	Count	2717	1856	771	5344	11,82 -0,003
		% within Sports participation	92,30%	94,80%	93,50%	93,30%	
	Yes	Count	227	102	54	383	
		% within Sports participation	7,70%	5,20%	6,50%	6,70%	
Total		Count	2944	1958	825	5727	
		% within Sports participation	100,00%	100,00%	100,00%	100,00%	

Data table 3 is derived from the question “Are you already running your own business / are you already self-employed?” This question is linked to the intensity of involvement in sport using the crosstab function. Looking at proportions of active entrepreneurs who are already running their own business among the sports participation categories, we see that 7.7% of our respondents who play sport regularly are actively involved in entrepreneurship, compared to 5.2% of those who play sport occasionally, and 6.5% of students who do not participate in any sports activity. We also subjected the results for this question to a statistical chi-square test. Based on the chi-square test we can say that this is a statistically significant difference that is not random. In this case, we see an interesting pattern in involvement in sports and active entrepreneurship. Also, based on these findings, we would be able to support our previous assertion that regular participation in sports can have a positive impact not only on entrepreneurial intentions but also on active entrepreneurship.

In addition to the previous analysis, another perspective we applied was exploring the relationship between students’ sports participation intensity and their entrepreneurial intention (Table 4 below).

Tab. 4 - Students' sports participation and entrepreneurial intention. Source: own research

Sports participation	N	Mean	Mean rank	Kruskal-Wallis test	Sig (2-sid.)	Pairwise comparisons		
						Reg.	Occ.	No.
Regularly	2944	3.79	2375,71	46,408	.000	-	.000	.000
Occasionally	1958	3.55	2201,28			.000	-	.003
Not at all	825	3.29	2003,74			.000	.003	-

As seen in table 4, students who regularly practice sports indicate the highest entrepreneurial intention, followed by students who practice sports occasionally. Accordingly, the lowest entrepreneurial intention was observed among university students who do not practice sports at all. According to the results of the Kruskal-Wallis statistics, the differences between all of the categories are significant. In this case, our results show a more straightforward pattern, suggesting that the entrepreneurial intention construct within the student population (irrespective of their actual engagement in owning or setting up a business) is positively related to sports participation.

Finally, going beyond the entrepreneurial activity or intention, we had a look at their potential predecessors, as we explored the relationship between sports participation intensity and the perceived levels of entrepreneurial capabilities (Table 5)

Tab. 5 - Students' sports participation and entrepreneurial capabilities. Source: own research

Capabilities	Sports participation	N	Mean	Mean rank	Kruskal-Wallis test	Sig (2-sid.)	Pairwise comparisons		
							Reg.	Occ.	No.
Identifying new business opportunities	Regularly	2944	3.83	2365,60	30,197	.000	-	.003	.000
	Occasionally	1958	3.66	2226,21			.003	-	.026
	Not at all	825	3.46	2069,59			.000	.026	-
Creating new products and services	Regularly	2944	4.04	2335,04	16,653	.000	-	,017	,001
	Occasionally	1958	3.90	2219,22			,017	-	NS
	Not at all	825	3.76	2123,88			,001	NS	-
Managing innovation within a business	Regularly	2944	4.09	2367,19	35,787	,000	-	,000	,000
	Occasionally	1958	3.84	2168,49			,000	-	NS
	Not at all	825	3.71	2086,68			,000	NS	-
	Regularly	2944	5.04	2368,69	35,143	,000	-	,000	,000



Being a leader and communicator	Occasionally	1958	4.81	2185,90			,000	-	NS
	Not at all	825	4.62	2075,52			,000	NS	-
Building up a professional network	Regularly	2944	4.30	2378,82	42,169	,000	-	,000	,000
	Occasionally	1958	4.05	2173,04			,000	-	NS
	Not at all	825	3.87	2062,39			,000	NS	-
Commercializing a new idea or development	Regularly	2944	4.08	2368,42	34,907	,000	-	,000	,000
	Occasionally	1958	3.85	2185,04			,000	-	NS
	Not at all	825	3.70	2076,17			,000	NS	-
Successfully managing a business	Regularly	2944	4.04	2361,18	30,489	,000	-	,000	,000
	Occasionally	1958	3.79	2176,82			,000	-	NS
	Not at all	825	3.67	2102,84			,000	NS	-

In Table 5, we focus on entrepreneurial capabilities or competencies and how different groups of respondents perceive them depending on the intensity of involvement in sport, i.e., we investigate whether individuals' participation in sport can be related to their perceived competencies. We can see that the highest values for entrepreneurial capabilities are reported by students who play sports regularly, followed by students who play sports occasionally. Conversely, the lowest mean values for entrepreneurial capabilities are observed for university students who do not play sports at all. According to the results of the Kruskal-Wallis test, the differences are statistically significant between students who play sport regularly vs. those who participate in the sport just occasionally or not at all. On the other hand, we found a significant difference between occasional sports players and those who do not participate in sports at all only in one case – identification of business opportunities. Thus, our findings suggest that perceived entrepreneurial competencies within the student population are positively related to regular sports activity. In other words, with increasing sports activity, there is also an increase in the self-evaluation of entrepreneurial capabilities, and those respondents who play sports regularly show the highest values.

Our authors' collaboration and our second consecutive research on the topic of entrepreneurship and sport only confirms our findings from previous research (Karlík et al., 2021) as well as the findings of other authors (Jones et al., 2020; Jones & Jones, 2014; Kelly et al., 2020; Nová, 2015; Pellegrini et al., 2020; Ratten, 2015). Increasingly, the positive impact of sports activity or involvement in sport towards developing entrepreneurial intentions, skills, and entrepreneurial thinking is highlighted. Furthermore, based on our findings, that are also in line with previous studies, we can say that sport does indeed stimulate the development of personality characteristics necessary not only for sport but also for entrepreneurship, as these are activities of a highly competitive nature in which it is often the mind and personality traits that determine success or failure.

Finally, like any other research, our study is subject to limitations. Given a self-assessment questionnaire, we perceive the recorded responses as skewed because a student may

overestimate or underestimate their perceived qualities. Conversely, with as much data as we were able to collect within our sample, there is a presumption that our findings can be reliable and that it is possible to build on our findings in future research.

## 5 CONCLUSION

The present paper focused on the search for the relationship between participation in sports activity and involvement in entrepreneurship, entrepreneurial intention as well as entrepreneurial capabilities. Thanks to the literature study and especially after conducting a quantitative survey based on questionnaire data within the GUESSS project, whose respondents were students of business but also non-business schools, we were able to reach valuable conclusions. These point to specific trends as well as influences between the fields of sport and business. Among the most important findings is identifying a positive trend that suggests that perceived entrepreneurial competencies within the student population are positively related to sports activity. At the same time, we conclude that there is potential for further publications in this area not only to raise awareness and education but also to support our claims with the research of a different nature.

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# CONSUMPTION BEHAVIOR OF ILLEGAL MIGRANT WORKERS DURING THE COVID-19 PANDEMIC: THEORETICAL FRAMEWORK

*Virak Khiev*

## **Abstract**

During the pandemic, the hardship of typical households might not be different from that of migrant workers in terms of financial resource allocations – that is, they reduce their consumption to some extent when their income falls. However, illegal migrant workers, perhaps, suffer the most during the pandemic due to financial constraint. By the time of this writing, study on consumption behavior of illegal migrant during the pandemic is not specifically documented. The main objective of this study is to examine how illegal immigrant workers respond to economic recessions caused by the Covid-19 pandemic in terms of consumption behavior. The analytical framework is the two-period consumption-saving model in which remittance variable is set to be constant and financial (borrowing) constraint is incorporated. The results show that they must reduce consumption in the current period significantly after being laid off or during lockdown by the same amount of falling in income, whereas consumption in the future period remains the same. Also, an anticipating fall in income due to lockdown and being unemployed will reduce the future consumption by same amount of fall in future income, whereas current income remains the same. Borrowing constraint makes it difficult for illegal migrants to maintain the level of consumption in both periods.

**Keywords:** *Consumption, Covid-19, Illegal Immigrant, Indifference Curve, Intertemporal Budget Constrain*

**Jel Classification:** *F22, E21, D11*

## **1 INTRODUCTION**

The COVID-19 pandemic, which began to spread widely across the world in early 2020, has caused a great global health crisis and economic recession. By the time of writing, the pandemic has been plunging hundreds of millions of people into poverty, infecting hundreds of millions of people and taking millions of lives. The economic downturns caused by the pandemic reduced the global GDP growth dramatically from 4% in 2019 to -3.3 % in 2020 (International Monetary Fund, 2021).

Extensive evidence shows that the pandemic negatively affects incomes and the livelihoods of people through altering the means of allocating their financial resources. In India, weekly household local income fell by INR 1,022 (US\$ 13.5), an 88% drop compared to the long-term average with another 63% reduction in remittances in the month immediately after India's lockdown announcement (Gupta et al., 2020). Households in the US and UK responded to the announce of pandemic by stocking up causing the rise in spending in the first march of 2020, but figures declined when the wide spread of virus came into reality afterwards (Baker et al., 2020; Chronopoulos et al., 2020). In other European countries, the aggregate spending dropped by around 25% in Sweden and, because of the shutdown, by 4 additional percentage points in Denmark (Andersen et al., 2020).

The plight of the typical household is not much different from that of immigrant population who keep a proportion of their income for their family members. Studies show that the challenges for international immigrants during the pandemic are fall in income, higher unemployment and debt, wage reductions and psychological distress (Adhikari et al., 2020;

Bhagat et al., 2020; International Organization for Migration, 2021). Takenaka et al., (2020) estimated the decline in wage income from job cuts in the developing Asia projecting to range from \$359 billion to \$550 billion. Migrant workers may be among the hardest hit groups. In addition to the economic and psychological costs, international immigrants were banned to travel across countries and if they could do, they must be placed under mandatory quarantines. In a survey by IMO, immigrant in Thailand were forced to reduce consumption on food despite assistance from local and international organizations (IOM 2021). The survey also indicated that over half of respondents didn't send any remittances to their family members while the remaining sent less than before the 2020-2021 pandemic.

Among immigrant population, perhaps, illegal migrants are the most vulnerable groups because of their difficulty to maintain their financial well-being since they lack legal status. Extensive empirical studies have been carrying out to examine how typical households and immigrants alter their spending amidst the ongoing global pandemic. However, such studies on the impact on illegal migrant groups are not specifically documented. This study will fill the gap by providing theoretical explanation of how consumption behavior of illegal migrant workers responds to the COVID-19 pandemic.

## 2 CONSUMPTION-SAVING MODEL

To analyze how consumption respond to economic recessions caused by the pandemic, the study will employ Consumption-Saving model in which a migrant worker has only two periods in allocating their resources. The two periods – period  $t$  (present or today) and period  $t+1$  (future or tomorrow) model is sufficient to analyze the dynamic behavior and considerably simplifies the analysis.

In this two-period model, a migrant worker consumes and saves in both periods, while optimizing their lifetime utility. The migrant earns income in the present and the future. He/she can save at some (real) interest rate. Because our subjects are illegal migrant workers, they might deposit their money in informal sources (i.e., informal saving group) which doesn't require official documents. The study will analyze the migrant's problem algebraically using calculus and an indifference curve - budget line diagram. Finally, we assume the migrant-sending behavior is influenced by altruistic motives and not by investment motives. By this way, the remittances remain constant despite falling in income.

The initial general migrant's problem can be expressed as follows:

$$\max_{C_t, C_{t+1}, R_t, R_{t+1}} U = u(C_t) + \beta u(C_{t+1}) + u(R_t) + \beta u(R_{t+1}), \quad (1)$$

$$0 < \beta < 1$$

Equation (1) represents the utility maximization function of a migrant worker at both periods, including the discount factor  $\beta$ . The migrant maximizes their utility from consumption in the host countries and maximizes their utility obtained from sending remittance to the home countries. Notice that instead of using consumption by remittance recipients in the home countries, the study uses remittances  $R_t$  and  $R_{t+1}$  to represent the amount of consumption as it equals the size of remittances sent by the migrant. Utility obtained by a (altruistic) migrant from sending remittances is the satisfaction from seeing their family members in the home countries better off.

Because remittances in both periods remain the same, the last two terms of function (1) become zero when taking partial derivative. And we have remittances at  $t$  and  $t+1$  to be constant such that  $R_t = R_{t+1} = \bar{R}$ .

Therefore, a migrant's problem becomes,

$$\max_{C_t, C_{t+1}} U = u(C_t) + \beta u(C_{t+1}), \quad (2)$$

$$0 < \beta < 1$$

Subject to budget constraint (in equality form),

$$C_t + S_t + (1 + \omega_t)\bar{R} = Y_t, \quad \omega_t > 0 \quad (3)$$

$$C_{t+1} + (1 + \omega_{t+1})\bar{R} = Y_{t+1} + (1 + r_t)S_t, \quad \omega_{t+1} > 0 \quad (4)$$

Here  $\omega_t$  is the cost of remittance transfer, which might change due to the demand and supply of remittance transfer products.  $S_t$  is the stock of savings.

We further assume that the financial institutions from which the migrant borrows does not allow them to borrow in the period t+1. This implies that they are not allowed to die in debt. Also, the migrant will consume/remitt all the remaining savings at period t+1. Hence, the migrant's saving at period t+1 is set to equal zero.

$$S_{t+1} = 0 \quad (5)$$

In equation (3), solve for  $S_t$ ,

$$S_t = \frac{C_{t+1}}{1 + r_t} + \frac{(1 + \omega_{t+1})\bar{R}_{t+1}}{1 + r_t} - \frac{Y_{t+1}}{1 + r_t}, \quad (6)$$

Plug (4) into (2) and rearrange,

$$C_t + \frac{C_{t+1}}{1 + r_t} + (1 + \omega_t)\bar{R} + \frac{(1 + \omega_{t+1})\bar{R}}{1 + r_t} = Y_t + \frac{Y_{t+1}}{1 + r_t}, \quad (7)$$

Equation (5) can be written as follow:

$$C_{t+1} = Y_{t+1} + Y_t(1 + r_t) - C_t(1 + r_t) - ((1 + r_t)(1 + \omega_t) + (1 + \omega_{t+1}))\bar{R}, \quad (8)$$

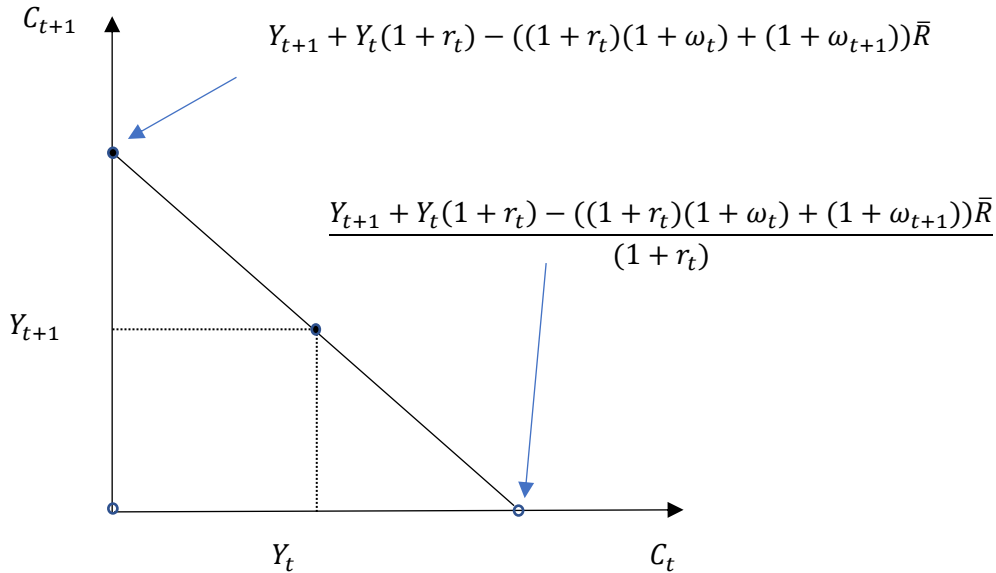


Fig. 1- Intertemporal Budget Constraint of a Legal Migrant Worker. Source: own illustration



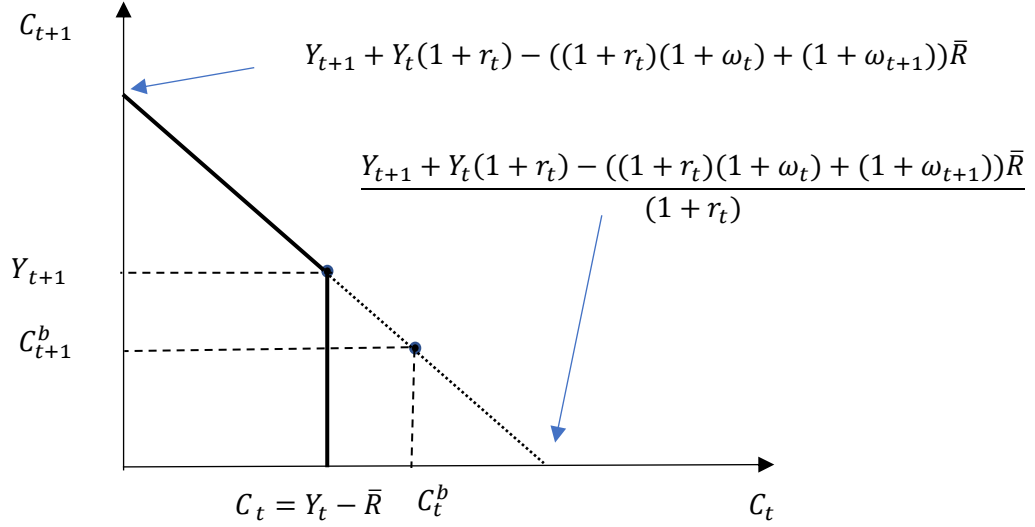


Fig. 2 - Intertemporal Budget Constraint of an Illegal Migrant Worker. Source: own illustration

Fig. 1 indicates a constraint that a legal migrant will face when decide how much he/she should consume. If he decides not send remittance at period  $t$ , then the total consumption at period  $t+1$  will be  $Y_{t+1} + Y_t(1+r_t) - r_t(1+\bar{\omega})\bar{R}$ . In contrast, if he decides not to consume at all at period  $t+1$ , the total consumption at period  $t$  will be  $\frac{Y_{t+1} + Y_t(1+r_t) - r_t(1+\bar{\omega})\bar{R}}{(1+r_t)}$ . The region on left of the budget line is feasible – a migrant can choose a bundle in this region. However, the region on the right of the line is not.

Fig. 1 present budget constraint of legal migrants who could access to financial services in the host countries. However, it is not always the case for illegal migrant workers who wish to save or borrow in the host countries due to their illegal status. Fig. 2 presents a budget line for illegal migrant workers who are restricted by the borrowing constraint. The budget line has a kink where  $C_t = Y_t - \bar{R}$ . At this point, the migrant is not allowed to consume more than its income (after remittance). Therefore, the feasible area is on the left of this point, whereas on the right the area is infeasible. Without financial service constraint, the budget line would be the dashed line with the dashed indifference curve.

For purpose of our study, we specify the determinant of consumption in both periods as follows:

At period  $t$ ,

$$C_t = f(Y_t, Y_{t+1}, \bar{\omega}, \bar{r}_t, \bar{r}_{t+1}) \quad (9)$$

At period  $t+1$ ,

$$C_{t+1} = f(Y_t, Y_{t+1}, \bar{\omega}, \bar{r}_t, \bar{r}_{t+1}) \quad (10)$$

## 2.1 Euler Equation and Optimization

The study will employ the Euler equation, a dynamic first order condition for an agent's problem optimization. However, the condition is not enough as it does not represent consumption or remitting function. Therefore, the change in exogenous variable will be explained using graph/indifference curve.

Assume a migrant's problem is:

$$\max_{C_t, C_{t+1}} U = u(C_t) + \beta u(C_{t+1}), \quad 0 < \beta < 1 \quad (11)$$

Replace future remittances in (11) with (8), utility function (11) becomes:

$$\max_{C_t, C_{t+1}} U = u(C_t) + \beta u[Y_{t+1} + Y_t(1+r_t) - C_t(1+r_t) - ((1+r_t)(1+\omega_t) + (1+\omega_{t+1}))\bar{R}] \quad (12)$$

$$\frac{\partial U}{\partial C_t} = u'(C_t) + \beta u'[Y_{t+1} + Y_t(1+r_t) - C_t(1+r_t) - ((1+r_t)(1+\omega_t) + (1+\omega_{t+1}))\bar{R}] \quad (13)$$

Equation (13) can be written as,

$$\frac{\partial U}{\partial C_t} = u'(C_t) + \beta u'(C_{t+1})[-(1+r_t)] \quad (14)$$

Set  $\frac{\partial U}{\partial C_t} = 0$ , we have Euler Equation specified as follows:

$$u'(C_t) = \beta u'(C_{t+1})(1+r_t), \quad (15)$$

Rearranging, we have

$$\frac{u'(C_t)}{\beta u'(C_{t+1})} = (1+r_t) \quad (16)$$

Equation (16) is called marginal rate of substitution (MRS). Note that right side of equation (16) equals the slope of budget line in equation (8). In Fig. 3, a migrant worker would choose point A ( $C_{0,t}, C_{0,t+1}$ ) which will maximize his utility.

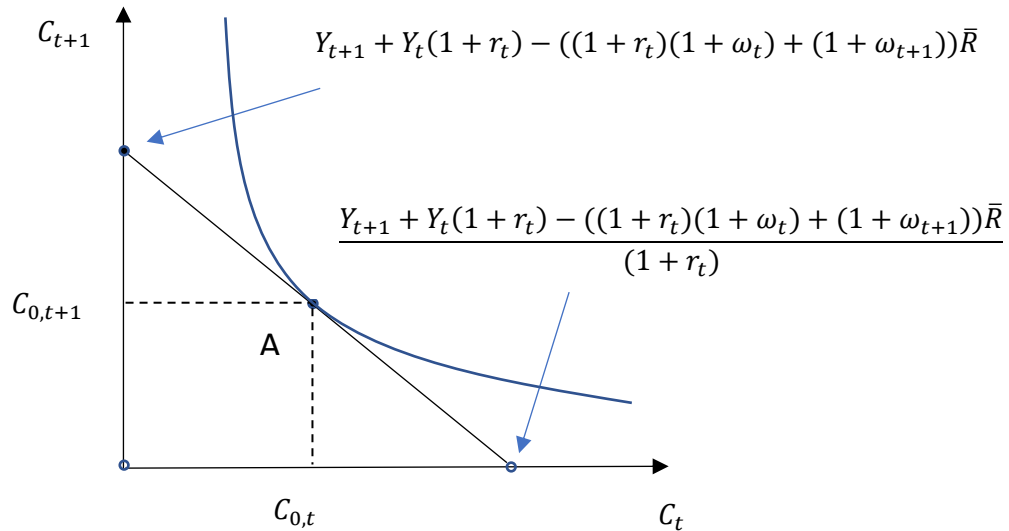


Fig. 3 - Indifference Curve of a (Legal) Migrant Worker. Source: own illustration

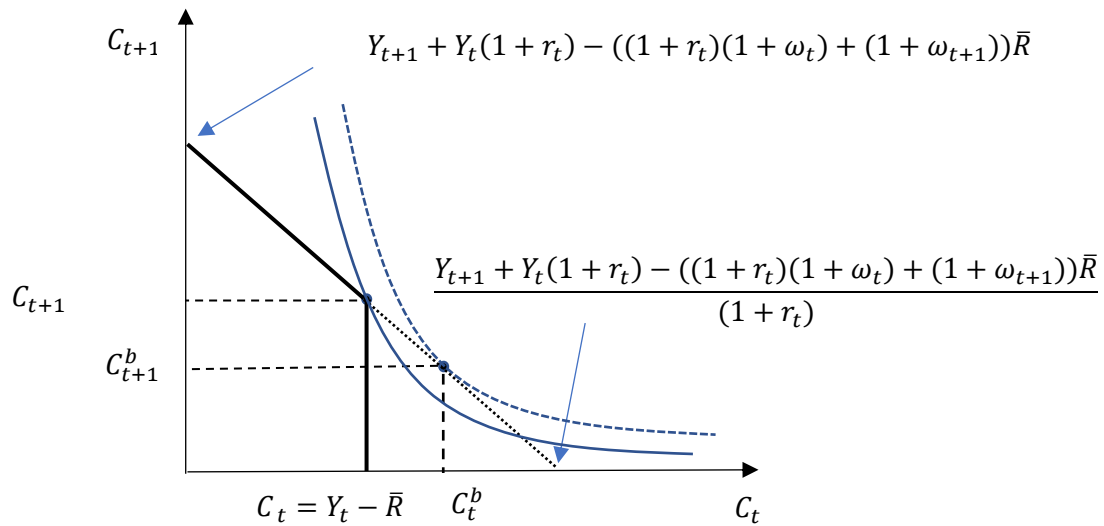


Fig. 4 - Indifference Curve of an (Illegal) Migrant Worker ( $S_t \geq 0$ ). Source: own illustration

For illegal migrant worker, due to borrowing constraints, the migrant would choose the consumption bundle where the indifference curve (the closest possible indifference curve) kisses the kink point of the budget line. So, the Euler Equation condition does not hold in this case as there is no tangency point. If the migrants prefer to save, the constraint would be non-binding.

### 3 CHANGE IN INCOME OF ILLEGAL MIGRANT WORKERS

Now that we have developed the baseline, we will examine how consumption behavior of illegal migrant workers respond to the pandemic. We observe that, during the 2020-2021 pandemic, immigrants experienced economic distress such as unemployment and wage reduction, and thus falling in income as their workplaces were forced to close multiple times. In this section, we will examine the effect of fall in income which we observe when the businesses are closed, or workers are laid off. In the next section, we will examine the effect of an anticipating fall in income which occurs when the migrants anticipate being laid off due to the fact that the businesses will be closed due to profit loss or lockdowns.

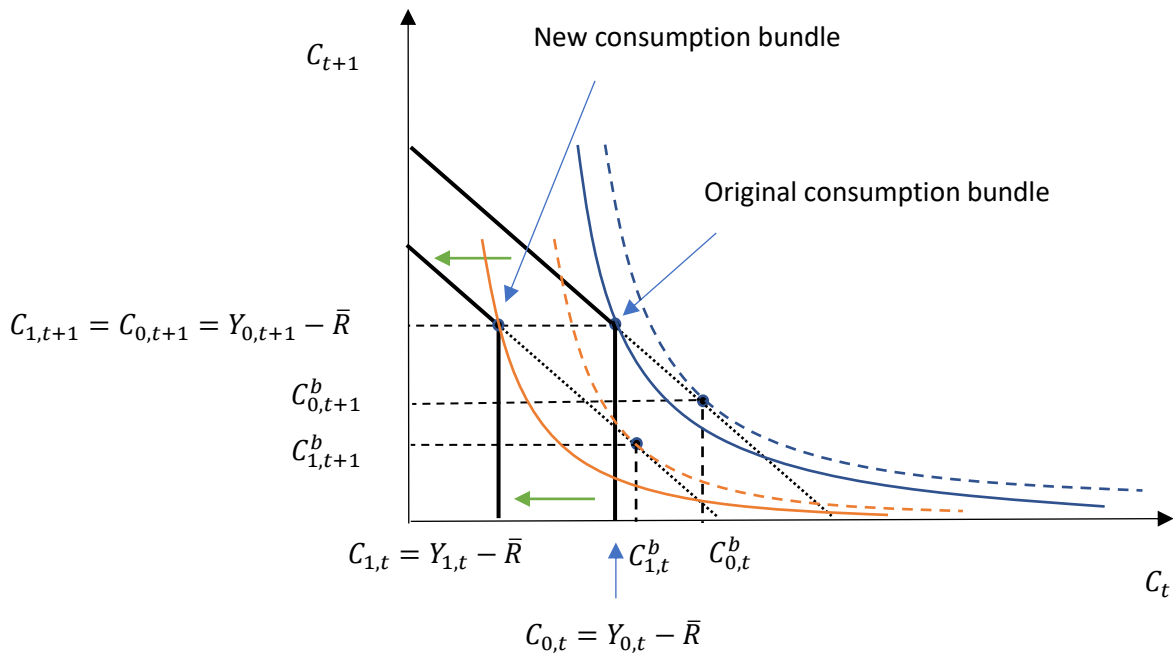


Fig. 5 - Consumption Behavior of an (Illegal) Migrant Worker. Source: own illustration

Figure 5 indicates that the response of consumption in the current and future period to the decrease in income in the current period. The fall in income shifts the budget line into the left. For legal migrant workers, the decrease in income would reduce remittances in both period from  $C_{0,t}^b$  to  $C_{1,t}^b$  and from  $C_{0,t+1}^b$  to  $C_{1,t+1}^b$ . For a legal migrant, if incomes decrease to an extent that the constraint does not cease to bind, the migrant will choose the bundle where the orange indifference curve kisses the budget line at the kink point. At this point, the consumption falls by the same amount of decrease in income at the current period  $C_{1,t}$ , whereas the future consumption remains the same.

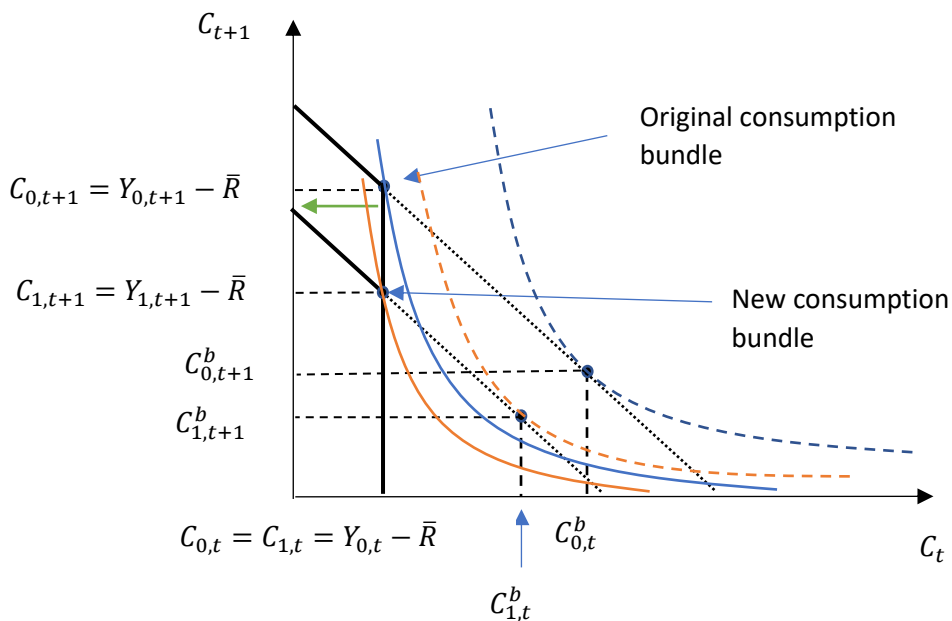


Fig. 6 - Change in Income at t+1 of an Illegal Migrant Worker. Source: own illustration

Now let us consider what happens to consumption in both periods in response to an anticipating decrease in income in the future period from  $Y_{0,t+1} - \bar{R}$  to  $Y_{1,t+1} - \bar{R}$ . Fig. 6 indicates that the decrease causes the endowment point to shift downward. For the case in legal migrants, they would reduce their consumption in both periods, as indicated by binding bundle which is unattainable. For illegal migrant, the best bundle would be the point that orange indifference curve kisses the budget line. In this new bundle, consumption falls by the same amount of anticipating falling income in the future period from  $C_{0,t+1}$  to  $C_{1,t+1}$ , whereas the current remittances remain the same.

Our theoretical findings suggest that during the COVID-19 pandemic, illegal migrant workers are the most vulnerable group as they are restricted by financial constraint. However, in practice, illegal migrant workers might survive during the pandemic by the relief and aids from the governments and humanitarian organizations. Although existing evidence has not been provided regarding consumption of illegal migrant workers, they show that the employment and income status of illegal migrant workers are at more risk than that of the legal ones due to possibility of deportation, paying fine for illegal stay and difficulty to improve wage condition, (İçduygu 2020).

Alternatively, one way that illegal migrant workers would respond to such crisis is to borrow money from their other migrant workers who reside within their social network in the host countries. Aparicio & Kuehn (2018) emphasizes a significant role of social network on determining remittance behavior of immigrants in Spain, and it could be the best way for illegal migrant workers to maintain the rates of remittances.

Issues regarding limitations and assumptions in the study, of course, should not be overlooked. First, we use unemployment and fall in income as proxy for the pandemic (it fits better for the case the GFC). The proxy might not be suitable in the case of pandemic, but they are something that occurred during the 2020-2021 pandemic. For better estimates, one could consider the uncertainty of pandemic trajectory which might happen over the course of 2020 and 2021. Second, we assume the remittances to be constant which is not case in most countries. However, such assumption is plausible in the country where digital transfer is widely used. Despite lockdown restriction, migrant workers continue sending remittances via digital channels. Second, the constant remittances also implies that migrant workers are altruistic which has been assumed in the model. Hence, this study would be more applicable in the context of the country that has high number of illegal migrant workers and who are altruistic; Thailand should be one of them. Empirical evidence suggests that Cambodian, Laos and Myanmar migrant workers in Thailand behaved altruistically (Vanwey 2004; Wongmonta, 2017).

## 4 CONCLUSION

This study examines how economic recessions caused by the COVID-19 pandemic influence consumption behavior of illegal migrant workers by utilizing the two-period consumption-saving framework. In the model, the migrant earns income in the present and the future (for simplicity, we assume that future income is known with certainty). The migrant can save or borrow at some (real) interest rate  $r_t$ , which it takes as given. Because they are illegal migrant, they can't borrow. At period  $t$ , the migrant must choose how much to consume and save, while holding remittances constant. Also, the study analyzed the migrant's problem both algebraically using calculus and using an indifference curve - budget line diagram. The key insights from the model are as follows: first, fall in income because of lockdown or being laid off reduce consumption by the same amount of fall in income in the current period whereas future consumption remains constant. Second the anticipating fall in income reduces future consumption by the same amount of fall in future income. However, the current consumption

remains unchanged. In the short term, understanding their consumption behavior during the pandemic or crisis is necessary for the governments of both sending and receiving countries to respond to the crisis in such a way that could ease their hardship illegal migrant workers in a timely manner. In the long-term, the governments should further make effort to legalize all the migrant workers. By doing so, they should be eligible for social security which guarantee their well-beings during crisis.

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# THE IMPACT OF CORPORATE GOVERNANCE ON COMPANY PERFORMANCE (LITERATURE REVIEW)

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## **Abstract**

The objective of this paper is to analyse the empirical research that has examined the relationship between corporate governance rating and firm performance in the last two decades, taking into account its possible implications for publicly traded companies in the countries of Visegrad Group (V4).

The research on corporate governance evaluation and its impact on firm performance is extensive. It varies from developed to developing countries, uses different mechanisms for corporate governance assessment and employs miscellaneous calculations to measure firm performance. This study focuses on corporate governance indices as a comprehensive way of measuring the overall level of corporate governance.

The literature review was undertaken using comparative analysis. The articles focusing on corporate governance indices and their impact on firm performance in academic journal databases since 2001 were explored. Out of the substantial amount of research, a representative sample was selected and analysed in greater detail.

The paper established that there is no consistent method of corporate governance evaluation and assessment of its impact on firm performance. Also, the findings vary from a strong positive relationship between corporate governance rating and firm performance to a non-existent or negative relationship. There is no doubt among researchers, however, that good corporate governance represents an important tool in company management.

From the factors determining the relationship between corporate governance rating and company performance, it was recognized that the institutional environment plays an essential role. The strong positive relationship is more often established in emerging markets, whereas in strongly developed economies with higher investor protection the results are mixed. Corporate governance rating also has a greater impact in countries with a continental law system than in countries with a common law system.

For further research, it is recommended to adopt a shared model of corporate governance rating. With respect to its content, it is necessary to reflect the type of legal system and financing. Furthermore, the corporate governance rating shall consider factors of sustainability. It is also recommended to pay attention to statistical and accounting correctness.

In the case of V4, i.e. the Czech Republic, Hungary, Poland and Slovakia, which have weaker institutional environments, the literature review provides evidence that corporate governance scoring can promote a higher general level of corporate governance, equipping companies with a competitive advantage and improving their access to capital.

**Keywords:** *corporate governance, corporate governance index, firm performance, investor protection, sustainable finance, Visegrad Group*

## **1 INTRODUCTION**

Can better corporate governance positively influence a company's performance? This question has been the subject of interest of numerous empirical studies around the world, which have



conducted research into the relationship between corporate governance quality and the level of company performance.

The interest in corporate governance increased after the serious corporate scandals of the 21<sup>st</sup> century (such as Enron, Parmalat, or later, in the European context, Volkswagen). Stringent corporate governance regulations have been adopted, and voluntary codes of behaviour implemented in order to prevent the financial and economic instability triggered by such events (Bozec, 2015).

Corporate governance represents an organizational system of the company, consisting of the distribution of competences for decision-making and supervisory powers between managers and other stakeholders (i.e. shareholders, creditors, employees, customers and suppliers). It enables the protection of rights of stakeholders (Korent, 2014), while simultaneously creating incentives for managers (Gerum, 2017). Corporate governance also sets a company's objectives within regulatory, business and social frameworks (Michelberger, 2016).

In order to comprehend corporate governance's effect on financial performance, it is necessary to rate its quality (Rossi, 2015). Corporate governance could be assessed either through separate components or as an overall corporate governance rating. Total corporate governance level can be measured by a rating, index, scorecard etc. The corporate governance index represents a quantitative tool for the evaluation of corporate governance standards in a company. It assesses adherence to corporate governance criteria (Bozec, 2015). Each of the indicators is given different weighting in the overall score, taking into account its impact on the company's risk and performance (Rossi, 2015). There are two types of corporate governance indices, i.e. commercially available or created by researchers themselves.

Enhancing corporate governance quality contributes to greater transparency and control (Bozec, 2015). Through trust and reliability, good corporate governance has the capacity to improve the financial performance of a company (IFC, 2014).

The relationship between corporate governance and firm performance has therefore been subject to extensive research in the last two decades. The goal of this study is a literature review of research so far on corporate governance's impact on firm performance. The study also aims to identify the components of previous studies, which can be used on corporate governance scoring of V4 countries, characterised by emerging markets, continental law legal systems and strong bank (rather than capital market) financing.

## **2 THEORETICAL BACKGROUND**

### **2.1 Importance of corporate governance**

The importance of corporate governance is supported by the agency theory. When separating ownership and control, conflicts of interest arise between managers and other stakeholders (Jensen & Meckling, 1976). The managers must be motivated by sufficient incentives, otherwise they prefer their own benefits to the interest of the stakeholders. Quality corporate governance, on the other hand, helps to prevent agency conflict and contributes to company stability (Shleifer & Vishny, 1997).

Interest in the influence of corporate governance on the behaviour of companies was prompted both in theory and practice by the publication of an article *Law and Finance* (La Porta & Lopez-de-Silanes, 1997). The authors demonstrated the relationship between law and corporate governance, market development and economic growth. According to their findings, the level of corporate governance in companies has a significant impact on the capacity of a company to

obtain capital and on the cost of its capital. It also influences its performance and distribution of corporate value among stakeholders.

There is an overall understanding by both academics and professionals that good governance leads to better financial performance (Bozec, 2015). Even though the positive relationship between company performance and good corporate governance should exist, it is however, not generally established (Djankov, La Porta, Lopez-de-Silanes & Shleifer, 2008).

## **2.2 Influence of legal environment and specifics of V4 countries**

From the point of view of general corporate governance level, the country institutional environment plays a larger role than the company's own position (Daines, 2010).

There are three important elements to the institutional environment, i.e. national economic development, legal system and the level of investor protection.

With respect to national economic development, markets can be assessed as developed, emerging and frontier, measured by GNI per capita, size and liquidity of the stock market and ease of attainability for foreign investors (MSCI, 2020). In developed markets, the corporate governance level is generally high. In developing markets, on the other hand, outstanding corporate governance level can be a discernible advantage.

Regarding the legal system, the common level of corporate governance is outstanding in countries where corporate governance is strongly regulated or where companies adhere to corporate governance voluntary codices. The principles of corporate governance are better anchored and enforced in countries of common law, which are also characterised by advanced stock markets, rather than in continental law, where bank financing prevails (Jensen & Meckling, 1976; La Porta & Lopez-de-Silanes, 1997).

The third factor is the general level of investor protection, as measured according to the World Bank Index of strength of investor protection.

With respect to the above, the corporate governance scoring is more important in countries with a weaker institutional environment, while it has the capacity to enhance a lower general level of corporate governance.

This study is aimed at the quality of corporate governance of publicly traded companies in V4. These countries are categorised as emerging or frontier markets. Their legal systems are continental law and they are bank loan, rather than capital market, oriented. With respect to investor protection, the Czech Republic and Poland only recently exceeded the world median, while Hungary and the Slovak Republic are still below. Thus, their institutional environment can be considered generally weaker.

## **3 METHODOLOGY**

The study provides a comprehensive review of the literature on the relationship between corporate governance scoring and company performance. Attention is paid to the articles where a corporate governance index is used (contrary to those where single components of corporate governance are employed), which measures the overall level of corporate governance of a company.

The study includes articles which have been published in academic journal databases since 2001. The main sources of literature are articles available from the databases Scopus and Web of Science, supplemented by other academic journals.

From the vast number of articles, the representative sample was selected to indicate the general course of research, with an emphasis on research results relevant to V4 publicly traded companies. The articles were selected so that they cover relevant markets (developed, emerging) and legal systems (common law, continental law).

The comparative, longitudinal and participant observation method are employed when reviewing the articles. The comparative method is used to present differences in previous research, with respect to the research components and results. The longitudinal method presents the development of research results in time. Through employment of the longitudinal method, the evolution in time of research is presented. By the participant observation method, it is determined what are the research results and which components are relevant with respect to V4.

## **4 LITERATURE REVIEW**

Below, results of literature review are presented. An overview of the results is contained in Table 1 in the annex.

### **4.1 Country**

In the case of developed markets, most of the studies were carried out in the USA (Ertugrul, 2009; Khanchel, 2007) and Canada (Bozec, 2015; Gupta, 2009). In Europe, in developed countries the research is most often aimed at particular markets, such as the UK (Akbar, 2016), Germany (Gerum, 2017) and Italy (Bernini, 2013; Rossi, 2015), or Europe as a whole (Nunez, 2017). The above countries can also be classified as common law and market oriented (USA, Canada and UK) or continental law and bank loan oriented (Germany, Italy) economies.

Regarding developing markets, most attention has been paid to Russia (Black 2001; Black & Love, 2006) and Asian markets, such as Korea, India, China, Singapore, Hong Kong (Black, 2006; Koehn, 2010; Saini, 2018). A not negligible volume of research has been addressed to European transition economies, such as Romania (Fülöp, 2015), Poland (Kowalewski, 2016), Croatia (Korent, 2014) or jointly Eastern Europe as a whole (Berke-Berga, 2019).

### **4.2 Sample**

There are significant differences between the number of companies included in the research.

Some researchers worked with a rather small sample of up to 100 companies (Black 2001; Fülöp, 2015; Koehn, 2010; Korent, 2014). Most of the studies were performed on a sample of between 100 and 500 companies (Akbar, 2016; Bozec, 2015; Gerum 2017; Gupta, 2009; Nunez, 2017; Rossi, 2015; Saini, 2018). A large number of 500 to 1000 samples was tested by a significant number of researchers (Berke-Berga, 2019; Black, 2006; Khanchel, 2007). Some research was performed on a vast amount of samples exceeding 1000 (Ertugrul, 2009; Renders, 2010).

### **4.3 Time period**

The period of observation varies from brief to lengthy. Some of the researchers performed a one-off examination (Koehn, 2010). Most of the observations lasted between 1 to 5 years (Black 2001; Berke-Berga, 2019; Black, 2006; Bozec, 2015; Fülöp, 2015; Gupta, 2009; Koehn, 2010; Korent, 2014; Kowalewski, 2016; Nunez, 2017; Renders, 2010; Rossi, 2015; Taliento, 2019). Slightly fewer studies were carried out between 5-10 years (Bernini, 2013; Black & Love 2006; Gerum 2017; Khanchel, 2007; Saini, 2018). Exceptionally, the research lasted for a period longer than 10 years (Akbar, 2016; Ertugrul, 2009).

#### **4.4 Corporate governance rating**

The researchers use either a self-constructed or commercially available corporate governance index. Commercially available indices are published by rating agencies (Bozec, 2015; Ertugrul, 2009; Gupta, 2009; Nunez, 2017; Renders, 2010), institutional shareholder services (Koehn, 2010), financial conglomerates (Saini, 2018) or investment banks (Black, 2001).

The choice of measurable goals (benchmarks) is crucial when creating a corporate governance index. The indices are based on legal rules (Black, 2006), voluntary codes of corporate governance (Akbar, 2016; Fülöp, 2015), stock exchange rules (Korent, 2014) or literature reviews (Berke-Berga, 2019; Bernini, 2013; Rossi, 2015). Some of the researchers use comprehensive materials, such as stock exchange rules, corporate governance codices and literature. The indices vary in their composition. The rules, whose observance is measured by corporate governance index, can be divided into the following sub-categories: (i) ownership characteristics (i.e. ownership structure), (ii) governance characteristics (e.g. corporate bodies and compliance) and (iii) strategic characteristics (e.g. structure, strategy) (Gerum, 2017).

From another point of view, the components of corporate governance index can be classified as rules regarding transparency, shareholders, board of directors, supervisory board, internal control and audit (Korent, 2014). For each category relevant characteristics are described. Transparency covers disclosure of information, shareholder rights and the protection of minority shareholders. Most requirements are mentioned for board of directors, considering its structure, size, competences, gender, independence (Saini, 2018). Other authors mention additional attributes to good corporate governance, such as remuneration (Rossi, 2015) or compensation (Nunez, 2017).

#### **4.5 Firm performance measurement**

The indicators for measurement of company performance are either accounting based, market based or mixed. Accounting based performance indicators are derived from financial statements. Market based indicators are drawn from market value. Mixed indicators use a combination of market and book value.

From the accounting based financial ratios, most researchers use ROA (return on assets) and ROE (return on equity) (Akbar, 2016; Gupta, 2009; Nunez, 2017; Renders, 2010; Rossi, 2015; Saini, 2018; Taliento, 2019). There are other indicators used, such as leverage, EVA (Fülöp, 2015) and Z-score (Bernini, 2013). Some researchers employ other firm characteristics, such as external financing, investment opportunities, firm size and firm performance (Khanchel, 2007).

Regarding market-based indicators, the market value is measured by market capitalization (Black, 2001; Saini, 2018), market value (Taliento, 2019), market performance (Bernini, 2013), stock returns (Ertugrul, 2009) and stock price appreciation (Koehn, 2010).

Most commonly used are mixed indicators based on both accounting and market performance. Among them, most popular is Q ratio (or Tobin's Q, i.e. market value of the company divided by buy-back costs) (Akbar, 2016; Black, 2006; Gupta, 2009; Korent, 2014; Kowalewski, 2016; Nunez, 2017; Saini, 2018). Other indicators can be mentioned, such as market-to-book (MtB) (Bernini, 2013; Taliento, 2019) or market-to-sales (MtS) (Renders, 2010).

#### **4.6 Statistical methods**

The linear regression model was adopted for the measurement of the relationship between corporate governance and firm performance. The measurement was undertaken as either static or dynamic regression, or both (Saini, 2018). Most of the researchers used the OLS (ordinary

least squares) method (Berke-Berga, 2019; Black, 2006; Black & Love 2006; Gupta, 2009; Khanchel, 2007; Renders, 2010; Rossi, 2015). Other researchers use the PLS (partial least squares)/SEM (structural equation modelling) methods (Taliento, 2019), panel regression (Bozec, 2015; Kowalewski, 2016; Wahyudin, 2017) and cross-sectional regression (Rossi, 2015) etc.

Additionally, to simple regression, a multiple regression analysis was employed in order to measure components of corporate governance indices (Ertugrul, 2009; Khanchel, 2007; Koehn, 2010; Nunez, 2017).

#### **4.7 Findings**

According to the findings, the relationship between corporate governance and company performance was established as positive, mixed, neutral or negative.

The majority of studies found a positive correlation between corporate governance and company performance (Black, 2001; Black, 2006; Black & Love, 2006; Bozec, 2015; Khanchel, 2007; Kowalewski, 2016; Korent, 2014; Nunez, 2017; Renders, 2010; Saini, 2018).

Numerous researchers did not succeed in finding any relationship between corporate governance and company performance (Akbar, 2016; Fülöp, 2015; Gupta, 2009).

In some cases, the relationship between corporate governance and company performance was classified as ambiguous (Gerum, 2017; Wahyudin, 2017). According to other researchers, the overall corporate governance score did not have any impact on firm performance, but its components did (Ertugrul, 2009). Certain researchers established a relationship between corporate governance and some financial indicators, whereas other indicators did not have any impact (Fülöp, 2015) or had negative impact (Rossi, 2015).

Some studies concluded that the relationship between corporate governance scoring and company performance was negative (Berke-Berga, 2019; Koehn, 2010; Rossi, 2015).

#### **4.8 ESG Index**

A corporate governance index may form part of a broader ESG index, which also concerns environmental and social issues as well as aspects of corporate governance.

As sustainable finance is nowadays widespread and encouraged by European law, the ESG index can often be encountered in recent European studies.

Taliento (2019) investigated the effect of non-financial factors of ESG (including corporate governance) on financial and market performance of companies, describing high levels of ESG as a competitive advantage. Pinillos (2020) established that (as well as corporate governance indices) ESG indices contain various components, of which not all are equally relevant. Apparently, corporate governance and ESG are closely interrelated, while companies with higher corporate governance ratings also have better ESG scores (Shrivastava, 2013). An efficient corporate governance system together with fulfilment of sustainability criteria contributes to and enhances trust contributing to market stability (Kocmanova, 2011).

## **5 DISCUSSION**

The results of previous research are inconsistent. The findings vary from strong positive correlation, through certain association to neutral or even negative relationship. Below, the main reasons are listed for such discrepancies.

## **5.1 Lack of systematic approach**

The variances can occur due to a lack of methodology regarding the inputs. The articles concentrate on different kinds of markets, i.e. developed (UK, USA, Canada), emerging (Poland, India, Indonesia) or frontier (Romania, Croatia). The sample of examined companies stretches from less than one hundred to a few thousand. The period of observation spreads from a one-off observation to more than ten years. There is no standardised way of measurement of corporate governance. Most of the indices are self-created, while some authors use a commercially designed index. The basis for measuring the level of corporate governance is usually a legal norm, the extension a legally non-binding code of corporate governance. However, there is not a consensus as to which elements should the corporate governance index include. As a result, the indices are constituted of different components and are based on various regulatory requirements. The methodology for examining the relationship uses different models of economic regression. The performance evaluation consists of market related measures and accounting based measures.

Therefore, it could be generally recommended to adopt a systematic approach towards construction and rating of the corporate governance to make the research unique. The shared model is also recommended for V4 in order to gain the objective results of corporate governance level.

## **5.2 Research evolution**

The research has undergone an evolution in the past twenty years. The relationship between corporate governance quality and firm performance appears to weaken with time (Renders, 2010). In the first decade of the twentieth century, the studies were carried on developed markets, such as USA and Canada. The first studies using a corporate governance index in developed countries confirmed that a higher corporate governance score led to greater firm performance (Black, 2001; Black & Love 2006). On the contrary, among the studies which did not find any association between corporate governance and firm performance, the majority is formed by studies undertaken on developed markets in recent years (Akbar, 2016; Daines, 2010; Ertugrul, 2009; Gupta, 2009).

Recently, most articles simply comparing corporate governance level and firm performance were aimed at developing markets (Wahyudin, 2017; Saini, 2018). On developed markets, the researchers have analysed specifics connected with corporate governance, such as leverage ratio (Berke-Berga, 2019), shareholders proximity to management (Bozec, 2015) etc. The researchers also studied the relationship between commercially established corporate governance indices and company performance (Nunez, 2017) or focused their research on the country as a whole (Martynova, 2013).

Most recent works on developed markets put more emphasis on corporate governance as a part of a broader ESG index (of which corporate governance forms an important part) bringing into question environmental and social issues on top of the governance (Taliento, 2019; Pinillos 2020; Shrivastava, 2013).

For further research, including research in V4, it could be recommended to include sustainable criteria in the corporate governance rating, due to worldwide upcoming regulatory requirements.

### **5.3 Country development and institutional environment**

The institutional environment of the country of origin also has a high impact on the level of corporate governance.

From the above diversification, it is also apparent that developed economies with established corporate governance more often prove no or negative relationship between corporate governance and company performance. In developing markets, the relationship is predominantly positive. As a rule, none or negative correlation is more often found in countries with developed markets, where the level of corporate governance is generally high and the difference between companies so subtle that it has no statistical relevance (Kowalewski, 016).

Countries of common law systems have a higher general level of corporate governance and investor protection (Renders, 2010).

The structure of a corporate governance rating should reflect whether the companies are market based (typical for common law) or bank-debt based (typical for continental law) (Gerum, 2017). The corporate governance scorecard of V4 should therefore be built on a bank funding model rather than a capital market funding model, suitable for companies in a continental law system.

### **5.4 Further possible explanations**

The result inconsistencies may be further possibly explained by various other factors. Among them are statistical problems, such as bias and endogeneity. When sufficiently controlled, the relationship between corporate governance rating and firm performance is clearly established by some researchers (Renders, 2010).

The differences may be in the ownership structure. The non-family companies have apparently better corporate governance scoring than family businesses (Bernini, 2013).

Other researchers believe that the contradictory results may origin in performance measures, selection of variables or correctness of financial reporting (Gordon, 2012).

## **6 CONCLUSION**

The purpose of this paper was the comparative analysis of an empirical research on the relationship between corporate governance rating and company performance. The results were further reviewed with an emphasis on the specific environment of V4 countries. Although there is a consensus among researchers that quality corporate governance has the capacity to contribute to better company performance, it has not been generally statistically proven.

The articles in academic journal databases were explored and the representative sample was selected. They were reviewed with the help of comparative, longitudinal and participant observation methods.

The results revealed that there is not a unique approach towards the research methods. The research has employed different volumes of samples, observation periods and various criteria for the measurement of the level of corporate governance; the methodology of measurement of firm performance differs as well as the choice of statistical methods. This lack of consensus results in a great variety of outcomes. The findings fluctuate from negative through neutral to a strong positive impact of good corporate governance on company performance.

The level of development of a country and legal system plays an important role in the relationship between corporate governance and firm performance, confirming a stronger

correlation in developing countries, where the general level of corporate governance and investor protection is weaker.

With respect to future research, a systematic approach should be adopted in order to define a unique set of corporate governance criteria and their measurement. Broader sustainability criteria should be taken into account when constructing an index.

The previous research proved that corporate governance represents a competitive advantage on markets with lower institutional environment. Therefore, corporate governance index may serve as an important tool for publicly traded companies in V4, whose markets stretch from emerging to frontier, and which are bank-loan oriented with a lower level of investor protection.

## Tables

Tab. 1 – Results of literature review. Source: own research

Study	Year	Sample of companies	Market	Time Period	Finding
<b>Akbar</b>	2016	435	Developed – UK	1999-2009	No relationship between corporate governance rating and firm performance
<b>Berke-Berga</b>	2019	799	Emerging – Eastern Europe	2016	Negative relationship between corporate governance rating and firm performance
<b>Bernini</b>	2013	98	Developed – Italy	2005-2011	Positive relationship between corporate governance rating and firm performance
<b>Black</b>	2001	21	Emerging – Russia	1999	Positive relationship between corporate governance rating and firm performance
<b>Black</b>	2006	515	Emerging – Korea	2001	Positive relationship between corporate governance rating and firm performance
<b>Black &amp; Love</b>	2006	99	Emerging – Russia	1999-2006	Positive relationship between corporate governance rating and firm performance
<b>Bozec</b>	2015	470	Developed – Canada	2002-2005	Positive relationship between corporate governance rating and firm performance
<b>Daines</b>	2010	6,827	Developed – USA	2005-2006	No relationship between corporate governance rating and firm performance
<b>Ertugrul</b>	2009	over 4,500	Developed – USA	2003-2006	No relationship between corporate governance rating and firm performance



<b>Fülöp</b>	2015	30	Emerging – Romania	2010-2015	No relationship between corporate governance rating and firm performance
<b>Gerum</b>	2017	100	Developed – Germany	2005-2010	Ambiguous relationship between corporate governance rating and firm performance
<b>Gordon</b>	2012	1,617	Developed - Canada	2004	Positive relationship between corporate governance rating and firm performance
<b>Gupta</b>	2009	200	Developed – Canada	2002-2005	No relationship between corporate governance rating and firm performance
<b>Khanchel</b>	2007	624	Developed – USA	1994-2003	Positive relationship between corporate governance rating and firm performance
<b>Koehn</b>	2010	60	Developing – Asia	2003	Positive relationship between corporate governance rating and firm performance
<b>Korent</b>	2014	25	Emerging – Croatia	2007-2010	Positive relationship between corporate governance rating and firm performance
<b>Kowalewski</b>	2016	298	Emerging – Poland	2006-2010	Positive relationship between corporate governance rating and firm performance
<b>Nunez</b>	2017	310	Cross-European setting	2013	Positive relationship between corporate governance rating and firm performance
<b>Renders</b>	2010	over 6,700	Europe	1999-2003	Positive relationship between corporate governance rating and firm performance
<b>Rossi</b>	2015	215	Developed – Italy	2012	Negative relationship between corporate governance rating and firm performance
<b>Saini</b>	2018	255	Emerging – India	2008-2015	Positive relationship between corporate governance rating and firm performance
<b>Landi</b>	2019	40	Developed – Italy	2007-2015	No relationship between ESG rating and firm performance
<b>Taliento</b>	2019	150	Developed – Europe	2014-2017	Positive relationship between ESG rating and firm performance

Wahyudin	2017	88	Emerging – Indonesia	2008-2021	Ambiguous relationship between corporate governance rating and firm performance
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# RE-BALANCING INTERNAL LOGISTICS USING ELEMENTS OF INDUSTRY 4.0

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## **Abstract**

Businesses are currently facing rapid changes not only from the side of customers, but also from the side of supplier markets. The economic activity of manufacturing companies is facing new challenges due to two global crises – COVID-19 and the Russia-Ukraine crisis. Logistics is once again gaining strategic importance, and its slimming, ideally with the use of elements of modern technologies, is more than desirable. Concrete solutions for lean logistics include, for example, the use of tractor units or autonomous trucks instead of classic forklifts. The article presents a specific project of improving internal logistics and implementing elements of automation in a manufacturing company. The aim of the project was to optimize the layout of the production lines, implement the AGV system and subsequently balance the work of forklift drivers. The key methods were the mapping of the current workplace, detailed time frames of all six forklift circuits. Furthermore, a Spaghetti diagram of logistic circuits was processed. This was followed by the implementation of AGV. The implementation of Industry 4.0 elements helped balance the pace of production lines and increase the efficiency of logistics circuits. The result was a reduction of one circuit with a return on investment within one year.

*Keywords: AGV, Industry 4.0, lean, logistic,*

## **1 INTRODUCTION**

The logistics and supply chain sector consists of numerous partners and stakeholders (Foster and Rhoden, 2020) The principles of autonomous lean production and logistics are applied today in all industries and are an integral part of the Industry 4.0 phenomenon. Industry 4.0 has been a major force framing the societal, economic and technological environment after 2010 (Herceg et al., 2020) The philosophy of Industry 4.0 is to strengthen the competitiveness of the Czech economy and prepare businesses for the ever-changing current and future requirements of customer and supplier markets. The Industry 4.0 was born in the production stage of the value chain merging physical production technologies with digital technologies. Travaglioni et al. (2020) says that Industry 4.0 promises higher efficiency and profitability as well as improved quality on the one hand, but it exposes companies to increased and often disruptive competition and difficult change management on the other hand. Supplying production lines and workplaces with material and subsequent storage of parts is one of the company's key processes. This is why internal logistics is a core part of manufacturing plants and an integral part of supply chains. Today's trend of consumer society forces large-scale manufacturers to constantly expand the production variants of their products, at the same time, manufacturers are constantly pressured to reduce production time and optimize the overall costs of the company. Automated Guided Vehicles (AGV) are a key element for the automation of logistics operations and intra-company logistics. The paper introduces the project of implementing this Industry 4.0 element in a company producing automotive fuel tanks. The main author of this paper was the leader of the entire project. The project contributed to the slimming of internal logistics and financial savings of the company.

## 2 THEORETICAL BACKGROUND / LITERATURE REVIEW

Industrial companies today are facing two important issues: the implementation of 4.0 technologies, that allow to automate and improve plant productivity, and the evaluation of more sustainable products and processes (Stefanili and Vignali, 2022). Lean manufacturing and logistics represents the integration of a set of methods and approaches, the principle of which is to eliminate all waste and current costs in the entire value stream. Lean production is widely recognized and accepted in the industrial setting (Mrugalska and Wyrwicka, 2017) Another possibility to handle the increasing complexity in manufacturing is given by the relatively new research field Industry 4.0. It aims to improve transparency through the digital linkage of each element involved in the production (May et al., 2018). The literature presents a number of perspectives on the reflection of the Lean philosophy with Industry 4.0. Dombrowski (2017) says that either Lean management is a prerequisite for Industry 4.0 or Industry 4.0 is seen as a promoter of lean manufacturing and logistics. The concept of Industry 4.0 is also inflected in the field of logistics with the introduction of automation, robotics, or modern warehouse systems with a key element of digitization (Zoubek et al., 2021). In the same way, in recent years, new perspectives on internal logistics have been gradually created due to the growing interest in the concept of lean production philosophy. The positive effect of the introduction of lean methods in production on logistics processes within the company is evidenced by the study Mourato et al. (2020). Fabri et al. (2020) defined internal logistics as the flows of materials inside the same business or the same plant. The role of internal logistics begins in the incoming warehouse and ends when the product is released from the finished goods warehouse for transport. Depending on how complicated the production and its organization is, the logistics processes can be very simple. Or they may require special tools and equipment to ensure adequate material flow. Most possible solutions in the field of internal logistics are related to automation and robotics (Poor et al., 2021). A cost-effective solution for automated material handling is represented by automated guided vehicle. As De Ryck (2020) states, AGVs form a large and important part of logistics systems in today's industry and have been used on a large scale in Europe for more than a decade. The Automated guided vehicle is a robot system that can realize automatic navigation without human interference in driving, which can improve production efficiency and safety greatly, enhance the automation level of production, liberate human and material resources and reduce operating costs (Deng et al., 2021) When choosing and deciding on the ideal handling device, it is necessary to consider the environment in which the given devices will be used. Whether it is piece, series or mass production. It is also necessary to take into account the specific technical, economic and social parameters of the given enterprise. That is why the mutual comparison of handling systems is very demanding, and any deviation from reality can ultimately cost considerable time and money. The impact of AGVs on the efficiency and performance of logistics processes is documented by studies (He and Prabhu, 2022; Stefanini and Vignali, 2022; Onias et al., 2021; De Ryck et al., 2020). For the successful implementation of Industry 4.0 elements, it seems appropriate to develop a lean automation plan, as stated by Vlachos et al. (2021). According to this study, the action plan should include three phases of lean automation system design, integration and continuous improvement.

### 3 METHODOLOGY

The main cause for implementation of the project was a central requirement of the company management to optimization of intralogistics using modern components of automatization. Rebalancing project of internal logistics in the company was originally planned for the period of 12 months. The real implementation of the project lasted 19 months in the period of July 2019 to January 2022. The project team was made up of people from different positions such as: an industrial engineer, a process engineer, a technical engineer, an engineer of logistics, a supervisor engineer, a production supervisor, a production manager, an IT manager, a company CEO and sales representatives of supplying companies. A primal part of the process was time consuming and it was very important the right charting and collecting the data for the right image of the present status and a consequent outlining of a new required status. The fundamental point was maximum available capacity of the equipment in one production day. Consequently maximum available capacity of the equipment in one production day was recounted for the number of packaging (containers, Carton Box). This number of packaging was divided by the coefficient 2 (because FLT always carries 2 pieces of containers at once) and we got the number of crossing the FLT needed for filing one processing dose in one processing day on one process equipment. We continued this way with each process equipment in the hall to find out the total number of FLT crossings. The example of the calculation bellow.

Welding machine has a capacity of a daily production capacity 1140 pieces- these products are packed in 8 pieces in one container = we will need a total of 138 pieces. It means that for placing 138 pieces of containers:  $2 = 69$  FLT crossings will be needed from the production for storing daily production of the welding machine. \*Package capacity is dependent on a particular project (the packaging is possible from 8 pieces to 28 pieces a container/a carton box) \*\* Total number of crossings is direct proposional to the kind of packaging. Consequently it was needed to gain the distance FLT crosses, the time the FLT manages to store the material and get back to the original place. It means that from the position A (production) we counted the time needed for storing a particular material to the position B (warehouse) and the way back to the point A. We followed this way with every process equipment in the hall to find out the final number of the movements, the distance and needed time for filing the material.

FLT Loops	Descripcion	target	stack	pcs	stack*pcs	number of moved	time of a one moved	total cumm.	capacity utilizationin %
nr.5	Removal of WIP SWB to the warehouse from production FC SWB	500	2	8	16	31	0:03:41	1:55:06	<b>25,58%</b>

Tab. 1- The example of the final extend of utilization FLT for the particular task, Sources: own

After gaining all these needed data as maximum processing equipment capacity (depends on the project), the type and the capacity of individual packaging, following the number of needed movements for FLT as well as needed the time for filing the material and overall distance. We were able to create Spaghetti diagram of individual logistics fieds with their current capacity utilization.

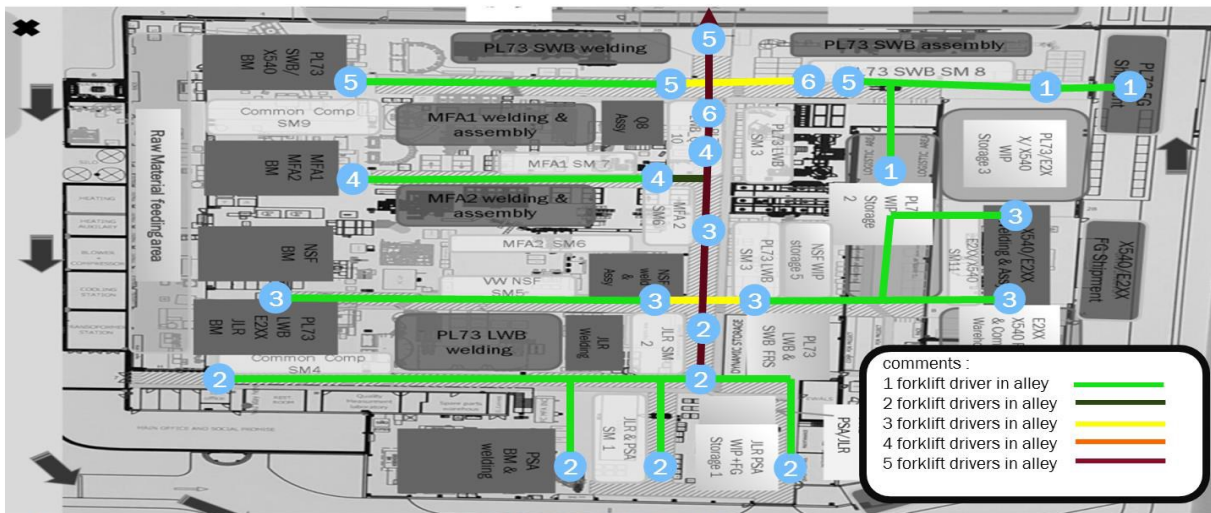


Fig. 1 - Charting the current status in internal logistics, Sources: own.

In the second part of the project it was needed to design a new demanded status of internal logistics at maximum processing capacity of all the status of factory processing 5 FLT of the processing shift. For an implementation of this not easy target was needed to adjust layout on the process line (the change of the product line Q8- total cost of the movement was 32 985,00€) and to balance of 3 product lines (Q7, Q8, A3). It was also needed to repass the old not-working container track, where all the repass with the change of 216 m of chains was the price set by the supplier 131 722,00 €.

#### 4 RESULTS AND DISCUSSION

On the grounds of the amount of the investment needed for repassing the container track the company decided not to invest to the old 14-year old container track. The company decided to invest and modernize and use the system AGV for automatization of some actions in logistics and to get to a required target. For using AGV technology and the effort of automatization of some logistics flow, it was needed to create a new detailed analysis and to count total AGV efficiency. It was also needed to design a new logistics concept. To plan the track AGV, to take the distance of the tracks AGV (the length) into account, the speed of AGV on the flat ground and in the curve and the time needed for the loading the containers. Cadence of the production lines project Q7=250 pieces/ a production during the shift and project Q8=150 pieces a production during the shift was one of the main conditions for counting the AGV efficiency and effectivity in the company. From the following analyses follows that for the automatization chosen processes and for the reaching required maximum of production capacity it is needed to supply for the production line Q8 one piece of AGV with the efficiency of 90%. And for the production line Q7 two pieces AGV are needed with the efficiency 77,5%. On the ground of these conditions the supplying company valued the whole concept AGV with the instalation 106 688,00€. This was much cheaper and fully automatic than repassing the old container track. This was also one of the reasons why the company decided to invest into the AGV system. Moreover by investing into the repassing of the old container track, it would not be more possible to adjust logistics flow. Consequently, we would be not able to go from 6 FLT per shift to 5 FLT per production shift and to meet the target. Initially, the plan was to deliver all 3 AGVs in January 2021 and the following implementation and launch by the end of February 2021. But due to the COVID -19 pandemic, the AGV manufacturer had a problem securing the required



order on time, so the AGV delivery was divided into two. The first AGV for the Q8 line arrived at the beginning of March and the remaining two AGVs for the Q7 were delivered at the beginning of May. The overall project was launched at the beginning of June 2021 against the original planned date – February 2021.

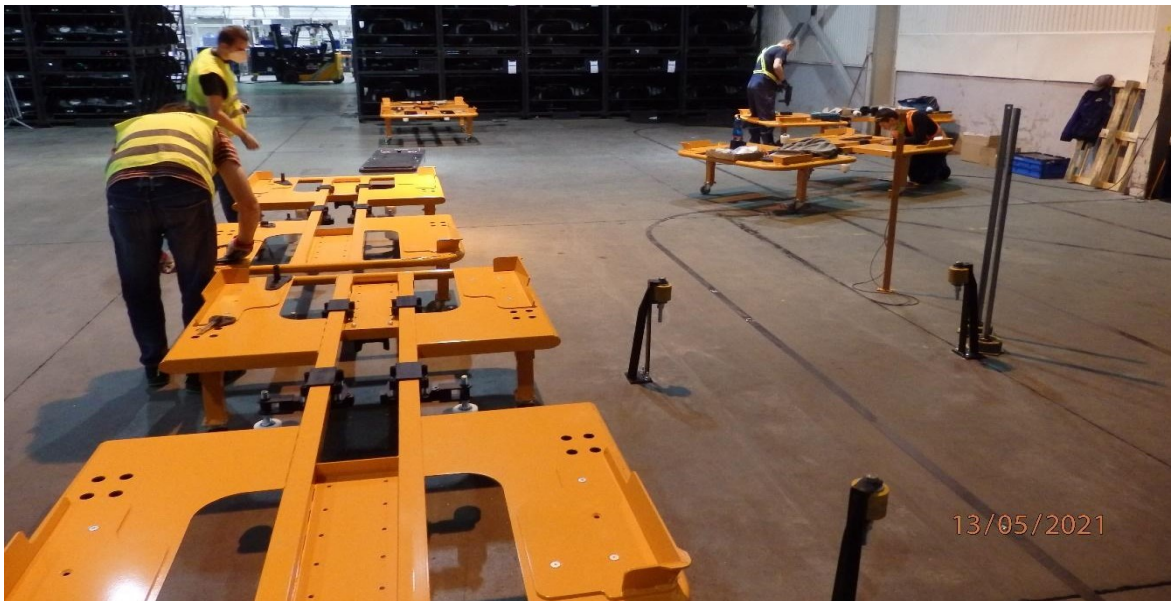


Fig. 2 - AGV installation for line Q7 - logistics part; Source: own.

During the transition period without the needed number of AGVs, we had to operate in a BackUp mode and ensure the shipment of the containers with the forklift trucks. We had to operate in such a limited mode for several months. After the completed installation of the AGV and the actual start-up, the first deficiency appeared to be resolved. Below I present some problems with AGV technology during the first months of the use in a real production process.

Problems with the AGV technology:

- 1) Failure of the AGV control unit- When the AGV passed between the halls, the floor was not level enough and the control unit was damaged during the passes and subsequent shocks. A total of 3 control units were replaced. Corrective action: By calking the gap between the transition of the halls this problem did not appear again.
- 2) Burning out the charging device. Overall we have changed five charging devices in both lines. We could not figure out what it might cause. By installing overvoltage protection the problem has not appear again.
- 3) AGV collision- In production there were a few anomalies followed by collision of two AGVs. Detailed observation (lasted a few days) of the whole process and setting the software, the problem was not repeated.
- 4) Damage to the guide rail- The guide rail was made of undersized material and for that reason it was warped when the forklift operator loaded it. On the new circuit, the AGV could not correctly guide the rail into the position and displayed error 104 AGV overloaded. In the exchange for the new one, more robust rail, this situation did not happen again.

We managed to adjust the layout of the production line, we set up the AGV system and eliminated the problems that arose. We adjusted the cadence of production line Q8 and the production line A3. Subsequently it was necessary to readjust the material flows correctly so

that we could switch from the current 6 forklifts to 5 forklifts per production shift. Therefore it was necessary to create a new complete analysis and design of a new material flow at the maximum possible utilization of the production plant. Recalculation of the production capacities of all equipment (depending on the project), packaging, followed by recalculation of the necessary movements for FLT. Taking into the account the new time required for the material storage as well as the new distances after the redistribution of logistics flows. Based on this, we again created a Spaghetti diagram of the individual logistics circuits, already with a new workload in a production with 5 FLT operators per shift together with the use of AGVs. The AGV technology as well as overall installation of this technology is not the cheapest. But it was by installing the AGV system that we were able to more effectively balance the work of FLT, which brought us a saving of one FLT operator per production shift and with a 3-shift production, which means saving 3 FLT operators.

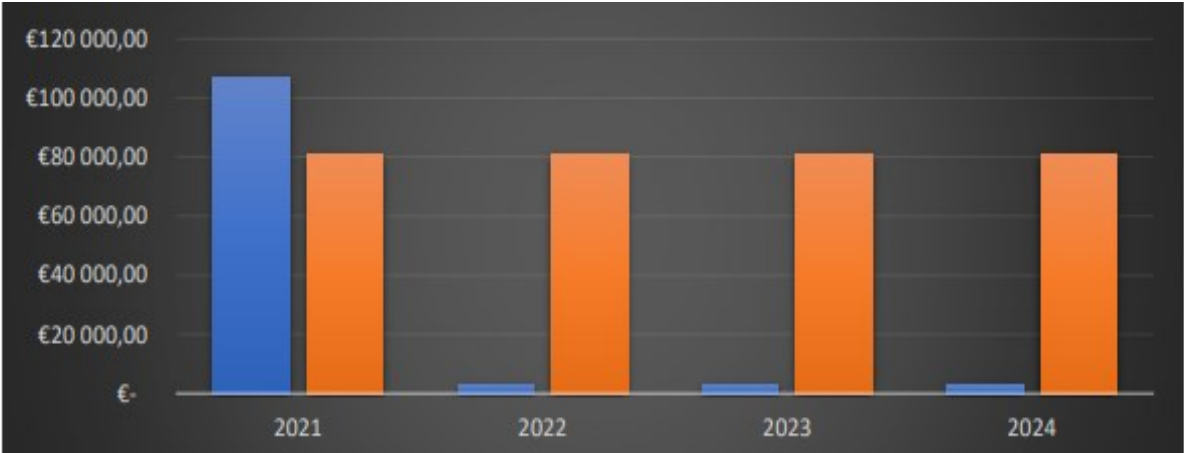


Fig. 3 - Annual cost comparison of AGV vs. FLT; Source: own.

As it can be seen from the attached graph, the installation of the AGV system is demanding for the initial investment in the first year of the project. In this case, it was an investment in the amount of 106,688 € while the annual costs of operating the FLT are in the amount of 80,760 €. What is the sum of the annual costs for 3 operators (3 X 25,000€.) and the sum of the annual FLT rental in the amount of 5,760€ (12 X 480€.). On the other hand, the annual costs for the AGV are only operational for minor modification in the amount of 3,000€, while the costs for the FLT and operators are the same every year. The annual saving on this project is 80,760€. While **the total saving on the project** (standard project duration of the 5 years) **is 403,800.00€.** (if the project continues, the price of savings will grow proportionally).

### 5 CONCLUSION

One of the requirements of companies for the rationalization of processes is the optimization of production and logistics flows with the use of elements of modern technologies. The goal of this contribution was to present a real project in a company producing automotive fuel tanks. The main author was also the head of the project team. The main cause for implementation of the project was a central requirement of the company management to optimization of intralogistics using modern components of automatization. The basic methods of this project were the analysis of the current state of movement of handling equipment, detailed mapping of material flows and calculation of capacities. The company decided to invest and modernize and use the system AGV for automatization of some actions in logistics and to get to a required target. The post summarizes the most essential parts of the AVG system implementation and

internal logistics rebalancing project. At the end, there is also an economic calculation of the entire project, including cost savings.

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# ENVIRONMENTAL ASPECTS AND PERCEPTION OF AIRBNB PROVIDERS AND CUSTOMERS

*Jakub Kóňa, Lenka Zemanová*

## **Abstract**

Sustainability and a sustainable lifestyle are not the preserve of a narrow group of people but are gradually beginning to concern all of us. Just like sharing economy, which seeks to maximize the use of already existing resources. Existing research is inconsistent and while one group of authors highlights the sustainability of the sharing economy, the other points to the lack of research on this issue. In the article, we examine the locals' opinions on the sustainability of shared Airbnb accommodation and thus we strive to increase the rate of research data in the framework of sustainable accommodation for both - researchers and the public. For data collection, we used a questionnaire survey, in which 546 respondents participated, and for the analysis of the obtained data, we used the sample statistics since, one-sample t-test and two-sample t-test methods. The results showed that shared accommodation is more sustainable than traditional hotel accommodation. These manifestations can be observed mainly in the lower rate of energy or water consumption per guest night. We consider the rating system and possible negative reviews to be the main reason, which acts as the main motivator. However, the ambiguous opinions of the respondents indicate insufficient communication about Airbnb's sustainability.

**Keywords:** *Airbnb, Environment, Questionnaire, Online Marketplace, Tourism, Business Travel*

## **1 INTRODUCTION**

Short-term rentals and the popularity of Airbnb are currently the subjects of many discussions. In these discussions, Airbnb is viewed as a competitor to traditional hotel accommodations and other accommodation models. Sharing economy also appears as a competitive way of accommodation from a sustainable lifestyle point of view. From the principle of using existing resources, shared accommodation should be more environmentally friendly than building new accommodation facilities of hotel accommodation. In addition, shared Airbnb accommodation seems to lead to saving energy, water and waste in comparison to traditional hotel accommodation per guest night.

This study attempts to address a research gap in several ways. The opinions of experts in the field of sustainability of the sharing economy are not uniform. It is also questionable whether the entities participating in this process are aware of the sustainability of the accommodation business at all. Moreover, the impacts of shared accommodation on the local population also constitute an unexplored gap.

This study has four main sections. The first section is the theoretical background, which discusses the background literature on Sharing Economy and Sustainability. The second area is a methodology, which will discuss the methods used to achieve the results. The third area is results and discussion and the fourth area is the conclusion.

## 2 THEORETICAL BACKGROUND / LITERATURE REVIEW

Nowadays, tourism services involve an economic section called "Shared economy". The term Sharing economy indicates that the intention is sharing, or maximizing the potential usage (Schor and Attwood-Charles, 2017). There are many designations for Sharing economy - collaborative economics, shared consumption, or non-proprietary lifestyles (Wu and Zhi, 2016). Other names arise from the degree of access economy development - digital economy, peer economy or platform economy (Görög, 2018).

Most authors delineate Sharing economy as providing temporary access to unused assets to other consumers using a peer-to-peer model (Botsman, 2013; Oxford learners dictionary, 2020; Cambridge dictionary, 2020; European Commission, 2020; Grit, 2020). Examples of the Sharing economy can be observed mainly in economic sections such as accommodation (Airbnb or HomeAway), transport (Uber, Lyft, or Bolt), guide services (ToursByLocals or Vayable) catering (EatWith, BonAppetour) (Gajdošíková, 2018). Sharing economy and first mentioned Airbnb is frequently presented as a sustainable form of tourism.

The term sustainable tourism represents the application of the sustainable development concept in tourism. The results of studies show, that the integration of ecotourism with the Airbnb model has not only a positive impact on the living conditions of residents but also supports sustainable local development (He and Mai, 2021). Today, however, the term "sustainable tourism" is being replaced by the term "responsible tourism", where key roles play active care for the life of the current and future generations (Novacká, 2013). Contu et al. (2019) summarize scientific papers that specify three pillars of sustainability, namely environmental, economic and social.

Environmental sustainability refers to the ability to conserve and manage resources, especially those that are not renewable or valuable in terms of life support. The environmental dimension, therefore, represents aspects of our ecosystem concerning human consumption and environmental management.

Airbnb shared accommodation tends to contribute to environmental sustainability and thus to sustainable development. The opinions of experts and researchers are not uniform. Some authors are defending the sharing economy and say, that it is a form of economic activity that will complement traditional forms of business, and will be generating positive economic, environmental and social effects (Bonciu and Bâlgăr, 2016). On the other hand, some studies suggest that besides the sharing economy contributing to addressing sustainability issues, its economic, environmental and social effects remain poorly understood (Mont et al., 2020). Airbnb accommodation units consume less energy than traditional models of accommodation (Airbnb, 2014). Airbnb furthermore states, that its properties consume overall 78% less energy compared to traditional hotel accommodation per guest night in Europe and 63% less in North America (ibid). Regarding water consumption, Airbnb properties were found to use 48% less water than traditional hotel accommodation per guest night in Europe and 12% less in North America (Midgett et al, 2017). On the other hand, some studies indicate that the induced carbon footprint of Airbnb hosts ranges from 3.84 to 602 kg CO<sub>2</sub>e/room-night (Wiedmann et al., 2020). It is questionable whether the entities that participate in this process are aware of this saving of the environmental load, or what the general public's opinion is. Overall, regarding the Systematic literature review carried out by Boar, Bastida and Marimon (2022) sharing economy should have a positive impact on the dimensions of economic, social and environmental sustainability.

This study aims to assess whether Airbnb, according to its users, contributes to a sustainable environment and environmental improvement in terms of three pillars of sustainability. In this study, we will also assess whether there are differences in the perception of the environmental

benefits of Airbnb between customers and providers. We research even if there are differences in the perception within age groups.

### **3 METHODOLOGY**

The main aim of this paper is to examine the locals' opinions on the sustainability of shared Airbnb accommodation. To execute this study's objective, the researchers adopted a quantitative method.

#### **3.1 Questionnaire**

A questionnaire survey is a direct approach for obtaining information on environmental perception concerning Airbnb in this study. The survey was carried out using Google Forms.

The online questionnaire contained 38 questions, which were classified into 5 areas – 5 chapters of the questionnaire. The first chapter (5 questions) was aimed at finding out the relationship between the respondent and shared accommodation in Slovakia (e.g. "What is your experience with Airbnb accommodation?" or "How many years have you been using Airbnb?"). The second, third and fourth chapters (27 questions) examined the respondents' opinions on individual aspects of the three pillars of sustainability within shared accommodation in Slovakia. The research was based on the principle of expressing the degree of identification with the statements we formulated (e.g. "Please express to what extent you agree with the statement that shared accommodation Airbnb causes an increase in the price level of real estate in the vicinity of the offer." or "Please express to what extent do you agree with the statement that Airbnb shared accommodation in Slovakia supports the convergence of cultures." or "Please state to what extent you agree with the statement that Airbnb shared accommodation in Slovakia is more ecological than its conventional forms (e.g. hotel)"). The last, fifth chapter (6 questions) consisted of additional questions that we asked respondents based on their previous answers (e.g. "What type of accommodation do you provide?" or "What motivated you to provide shared accommodation?").

Survey took place online from 03.11.2021 to 21.11.2021. Students of the Tourism Technology course at the University of Economics in Bratislava took part in the initial data collection. These students were subsequently asked to address their family members to take part in the research. This survey sample consisted of 546 respondents after filtering out incomplete responses. Of the 546 respondents, 186 were men, and 360 were women. The average age of the respondents was 30.57 years, and the median age was 26 years. Participants are divided into two groups according to their age, with the Younger group comprising people under 40 and the Older group comprising people aged 40 and over. Thus, 432 respondents were in the Younger group and 114 in the Older group. The survey was attended by 375 respondents who are customers and 171 respondents who are providers of Airbnb accommodation.

Respondents were asked for five statements on environmental attitudes related to Airbnb:

- S1. Compliance with sustainable oriented lifestyle
- S2. Positive impact on the environment
- S3. More ecological than standard forms of accommodation
- S4. Provides higher energy savings than standard forms of accommodation
- S5. Provides lower water consumption than standard forms of accommodation

The participants responded to these statements with these five answers:

1. Totally Disagree
2. Mostly Disagree
3. Neutral (I do not know / I have no opinion)
4. Mostly Agree
5. Totally Agree,

Due to statistical calculations, we then transferred to the Likert scale, where 1 is the value for Totally Objects, and 5 is the value for Totally Agree.

### 3.2 Data a methods

We have used the procedures mentioned above to construct a data source that consists of 546 observations for five statements, which we will refer to as S1 to S5 in the following sections. Table 1 gives the fundamental statistical indicators for all five statements.

Tab. 1 – Descriptive statistics of respondents' answers. Source: own research

Indicator	S1	S2	S3	S4	S5
Mean	3.6575	3.5733	3.6886	3.6484	3.4066
Standard Error	0.0373	0.0383	0.0371	0.0376	0.0377
Median	4.0000	4.0000	4.0000	4.0000	3.0000
Mode	4.0000	3.0000	4.0000	4.0000	3.0000
Standard Deviation	0.8705	0.8940	0.8664	0.8784	0.8818
Sample Variance	0.7577	0.7992	0.7506	0.7715	0.7775
Kurtosis	0.2619	-0.0623	-0.1774	-0.3636	-0.1867
Skewness	-0.4489	-0.2293	-0.3382	-0.2790	-0.0848
Range	4.0000	4.0000	4.0000	4.0000	4.0000
Minimum	1.0000	1.0000	1.0000	1.0000	1.0000
Maximum	5.0000	5.0000	5.0000	5.0000	5.0000

Based on the objectives we set at the end of the theoretical chapter, we decided to use the selected statistical methods to analyse the attitudes of people who came into contact with Airbnb, either as customers or providers.

We will use the methods of sample statistics since, in this research, we are only examining a sample. The whole population in this study are users of Airbnb from Slovakia. To investigate whether Airbnb users in Slovakia are neutral on the environmental aspects of Airbnb, we used a one-sample t-test. The hypotheses we have established are as follows:

$H_0$ : Means of the whole population answers are equal to 3.

$H_1$ : Means of the whole population answers are not not equal to 3.

To investigate differences between people's responses by age (Younger vs Older) and the degree of participation in Airbnb (Customer vs Provider) used a two-sample F-Test for equality



of variance, where the null hypothesis is "Variances of two samples are equal". Subsequently, we used a two-sample t-Test for equal/unequal means (based on the results of the previous step), where the hypotheses are:

$H_0$ : Means of the whole population answers are equal.

$H_1$ : Means of the whole population answers are unequal (statistically significant).

We decided to use the non-parametric t-test, instead of using parametric tests such as the Mann-Whitney test or the Wilcoxon-Mann-Whitney test have very similar rejection rates if the sample is large, and even heavily skewed (Fagerland, 2012). That is our case. There is a discussion about the appropriate method which should be used taking into account the Likert scale. But this discussion is way beyond the goal of this study.

All statistical calculations were performed in MS Excel, taking a significance level of 0.05.

### 4 RESULTS

In this chapter, we will look at the evaluation of the survey results. Figure 1 shows the total response rate to statement 1.

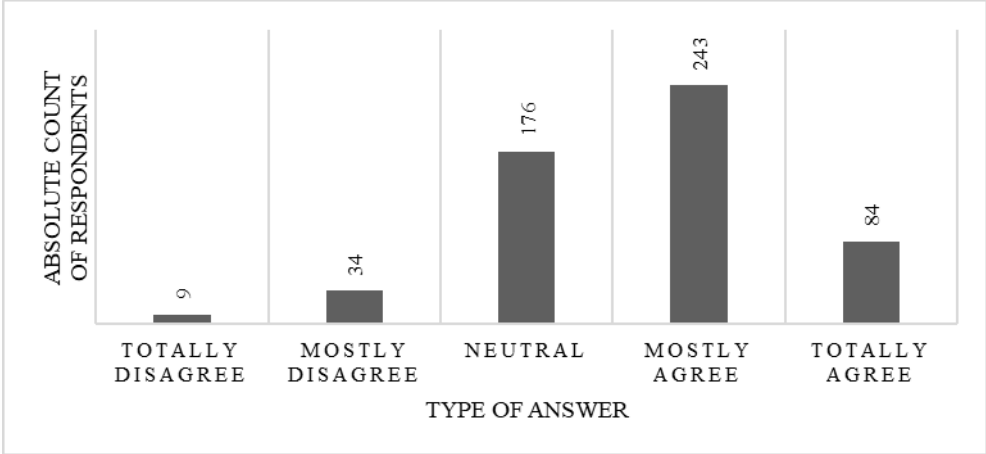


Fig. 1 – Absolute count of answers to statement 1. Source: own research

Statement 1 concerns the compatibility of accommodation through Airbnb with modern sustainable lifestyles. The highest number of responses was recorded with the option "mostly Agree", of which 243 represented 44.5% of all responses. 32.2% of respondents were neutral. Only a few respondents disagreed with the assertion that Airbnb complied with the sustainability principles. Figure 2 shows the response rates to statement 2.

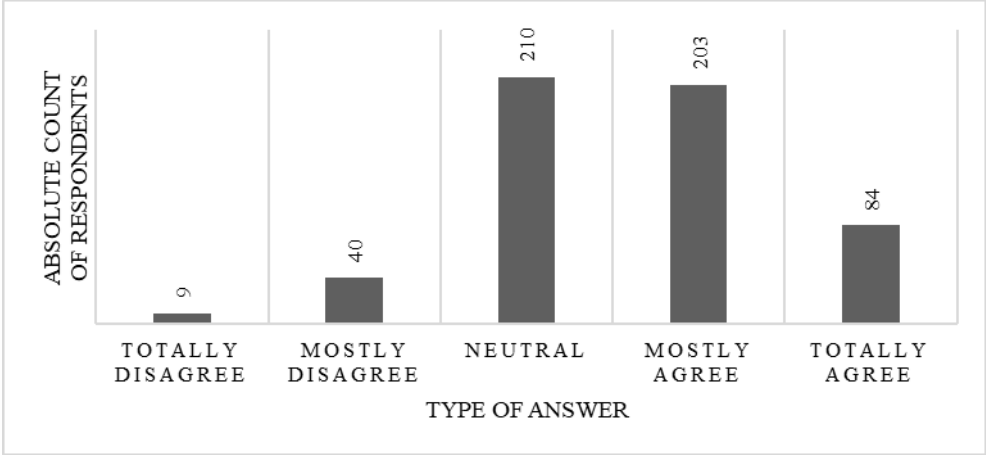


Fig. 2 – Absolute count of answers to statement 2. Source: own research

Statement 2 concerns the positive environmental impact of Airbnb. The response rate was highest with the "Neutral" option. There were 210 of them, representing 38.5% of all responses. Precisely 203 respondents (37.2%) mostly agree that Airbnb positively impacts the environment. On this point, too, the minimum number of respondents disagreed with the assertion that Airbnb complied with the sustainability principles. The response rates to statement 3 are shown in Figure 3.

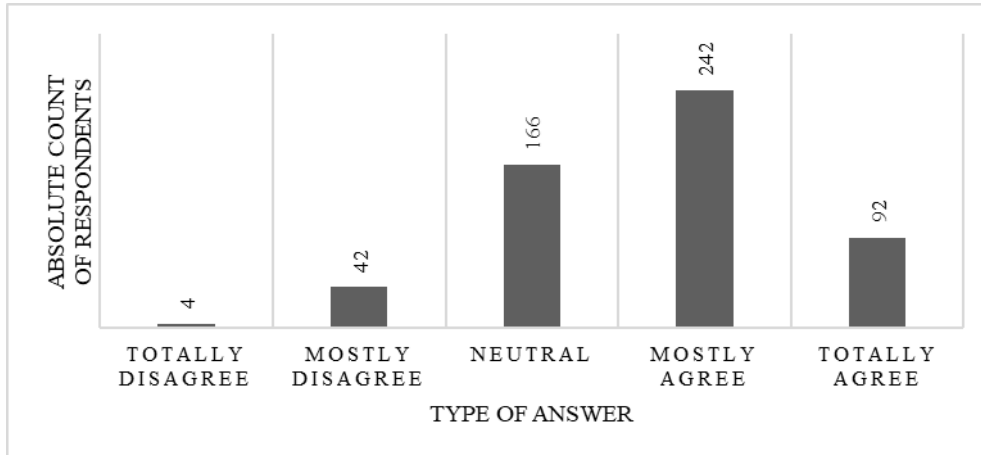


Fig. 3 – Absolute count of answers to statement 3. Source: own research

The situation in statement 3 is very similar to statement 1. Up to 59.2% of the most agreed respondents claimed that accommodation through Airbnb is more ecological than traditional forms of accommodation. Some 30.4% of the respondents were neutral. The response rates to statement 4 are shown in Figure 4.

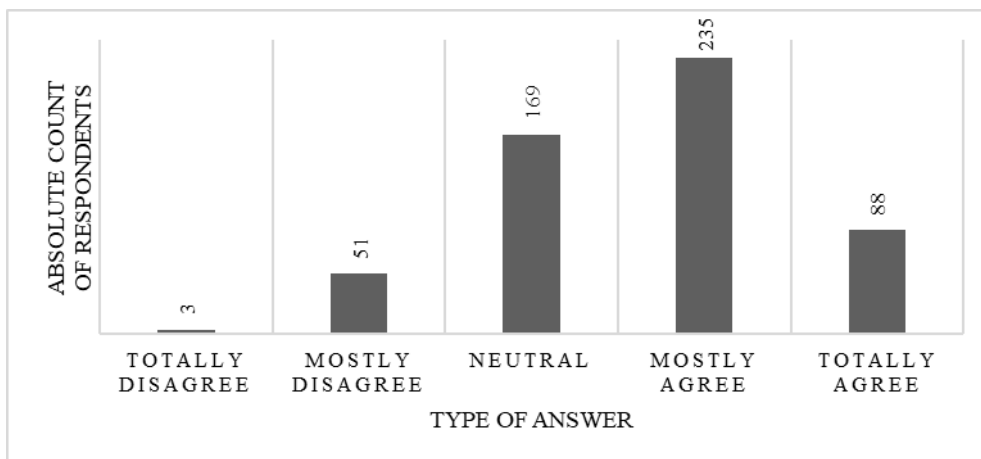


Fig. 4 – Absolute count of answers to statement 4. Source: own research

The results are very similar to statement 3. In the case of statement 4 totally agree, 16.1% of respondents and mostly agree, 43% of respondents claim that Airbnb is more energy efficient than traditional forms of accommodation. A neutral response was received from 169 respondents, almost 31%. Only 0.5% of the respondents were completely disconnected. The response rates to statement 5 are shown in Figure 5.

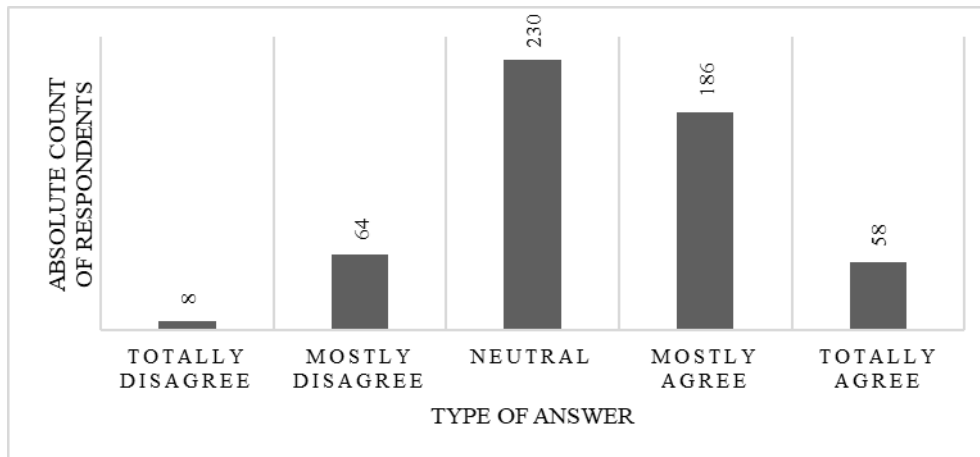


Fig. 5 – Absolute count of answers to statement 5. Source: own research

The absolute figures for statement 5 are very similar to those for statement 2, where neutral answers prevail. Approximately 42.1% of the respondents stated that, in their view, it was not more economical to consume water than the traditional accommodation of Airbnb. However, 44,7% believe that Airbnb can or is more economical in terms of water consumption than conventional forms of accommodation.

A significant left-sided skewness in the statistical set can be observed for all statements. It is, therefore, appropriate to examine whether the whole population and not just the sample are more oriented toward positive responses within all responses. Results of the one-sample t-test for equality of mean value three are given in Table 2.

Tab. 2 – Results of one-sample t-Test. Source: own research

Indicator	S1	S2	S3	S4	S5
Mean	3.6575	3.5733	3.6886	3.6484	3.4066
Variance	0.7577	0.7992	0.7506	0.7715	0.7775
Observations	546	546	546	546	546
Hypothesized Mean	3	3	3	3	3
df	545	545	545	545	545
t Stat	17.6500	14.9836	18.5734	17.2477	10.7747
P(T<=t)	<0.001	<0.001	<0.001	<0.001	<0.001
t Critical	1.9643	1.9643	1.9643	1.9643	1.9643

Since the p-value is significantly lower than the significance level (0.05) on all five issues, we reject the null hypothesis that the average equals 3. Furthermore, since the average value is greater than 3, we can assess the positive attention to all environmental aspects related to Airbnb that we examined for the respondents. The results of the F-Test and the t-Test for differences between age groups are given in Table 3 below.

Tab. 3 – Results of two-sample t-Test – comparing seniority-connected perception. Source: own research

	Statement no.	1	2	3	4	5
Variance	Younger	0.7194	0.7708	0.6668	0.7352	0.7462
	Older	0.8714	0.8465	0.9667	0.7906	0.8304
Mean	Younger	<b>3.7037</b>	<b>3.6343</b>	<b>3.7662</b>	<b>3.7315</b>	<b>3.4699</b>
	Older	3.4825	3.3421	3.3947	3.3333	3.1667
F-test (Equality of variances)	F	0.8256	0.9105	0.6898	0.9299	0.8986
	P(F<=f)	0.0912	0.2542	0.0047	0.3022	0.2263
	Equality	Equal	Equal	Unequal	Equal	Equal
t-Test Two-Sample (Equality of Means)	t Stat	2.4247	3.1286	3.7103	4.3760	3.2956
	P(T<=t)	0.0078	<0.001	<0.001	<0.001	<0.001
	Equality	Unequal	Unequal	Unequal	Unequal	Unequal

For statements 1, 2, 4 and 5, the p-value in the F-Test above the significance level indicates that the null hypothesis cannot be rejected. We will therefore consider the sample variance as equal (the difference is not statistically significant). In the case of statement 3, we reject the null hypothesis, and the variance is therefore statistically significant. F-Test results helped us to decide which test characteristic was subsequently used. Based on the results of the t-Tests, it can be concluded that we reject the null hypothesis on the equality of the mean values in all the statements. Concerning the average group response rates, we also note that Airbnb is more environmentally friendly to younger respondents (those under 40). Table 4 below shows the results of the F-Test and the t-Test for the differences between customers' and providers' perceptions of environmental aspects.

Tab. 4 – Results of two-sample t-Test – comparing customer/provider perception. Source: own research

	Statement no.	1	2	3	4	5
Variance	Customer	0.7647	0.8014	0.7269	0.7606	0.7521
	Provider	0.7467	0.7990	0.7684	0.7691	0.8370
Mean	Customer	3.6613	3.5733	<b>3.7627</b>	<b>3.7147</b>	3.4187
	Provider	3.6491	3.5731	3.5263	3.5029	3.3801
F-test (Equality of variances)	F	1.0240	1.0030	0.9460	0.9890	0.8985
	P(F<=f)	0.4346	0.4974	0.3294	0.4597	0.2007
	Equality	Equal	Equal	Equal	Equal	Equal
t-Test Two-Sample (Equality of Means)	t Stat	0.1519	0.0028	2.9777	2.6266	0.4735
	P(T<=t)	0.4397	0.4989	0.0015	0.0044	0.3180
	Equality	Equal	Equal	Unequal	Unequal	Equal

For all statements, the p-value above the significance level in the F-Test indicates that the null hypothesis cannot be rejected. We will therefore consider the sample variance as equal (the difference is not statistically significant). So we used the t-test for equal variance in all statements. Based on the results of the t-Tests, it can be concluded that, in statements 3 and 4, we reject the null hypothesis on the equality of the mean values. Given the mean group response rates, we also note that the Airbnb group of customers consider Airbnb more environmentally friendly. For statements 1, 2 and 5, these differences are not significant.

## 5 DISCUSSION

As part of the sharing economy, Airbnb directs its activities towards the sustainable development of tourism and thereby strives to have a positive impact on the environment. These opinions also prevail among our respondents, as we reject the null hypothesis in the case of the first two statements. In addition, the average value is greater than 3, so we can assess the positive attention towards two researched aspects. This finding is consistent with previous studies (Bonciu and Bâlgăr, 2016). As a sharing economy, Airbnb strives to maximize the use of already existing resources, which has a positive impact on the environment and is therefore sustainable. We further register the same results in the case of the claim that shared Airbnb accommodation is more ecological than traditional hotel accommodation. This claim can be precisely monitored on two aspects, which are energy consumption and water consumption. In the case of these statements, we also reject the null hypothesis and based on the average value, which is greater than 3, we can assess the positive attention towards the last two researched aspects again. We assume that the primary motivator for savings is the rating system that Airbnb has in place. In the environment of this evaluation system, both the provider and customer are motivated to behave rationally. Excessive consumption of water or energy, which would be considered wasteful, could result in a negative review, which would lower their rating and could thus affect further participation in the sharing economy system. Traditional hotel accommodation does not apply such procedures in practice, it does not penalize its clients for excessive consumption of energy or water, and their clients are therefore not motivated to behave rationally and ecologically.

Secondly, when analyzing the relationship between the attitudes on researched aspects and the age of the respondents, we did not reach any significant results. We can assume that the category of respondents "Older" consisted of people who, due to their age, are aware of the potential negative consequences of their behaviour on the environment. On the other hand, it is a positive finding that even the respondents from the "Younger" category showed responsible behaviour. It is necessary to emphasize that the shared economy is more used by people from the "Younger" category.

As part of the last analysis, in which we examined the relationship between the environmental aspects of shared Airbnb accommodation and the status of the participants, have analyzes shown, that the Airbnb group of customers consider Airbnb more environmentally friendly, especially in the case of energy savings. This finding may indicate that customers directly tend to save energy in the case of renting a foreign accommodation unit. This statement is consistent with our earlier analyzes and repeatedly emphasizes the finding that Airbnb accommodation is more energy efficient than traditional hotel accommodation per guest night.

Despite the demonstrable sustainability of brick-and-mortar accommodation, when analyzing the answers, we moved around the middle values of the Likert scale. Although the answers tended to have a positive perception of shared Airbnb accommodation from the point of view of sustainability, these answers were not completely unambiguous. This is consistent with the findings of some previous research (Mont et al., 2020). We are therefore considering whether

the communication of the company's sustainability is sufficient and whether Airbnb should communicate its demonstrable sustainability to a greater extent. This would result in a clearer public belief about sustainable business in the field of green accommodation and could lead to an increase in the occupancy rate of accommodation.

The three-pillar sustainability scheme deals with two other aspects of sustainability, which are economic and social. These aspects are no less important but were not the subject of our research, and we, therefore, recommend conducting a similar analysis of the collected data on other pillars of sustainability in the future to complete the picture of the sustainability of shared Airbnb accommodation in Slovakia.

## 6 CONCLUSION

Sustainability and a sustainable lifestyle are not the preserve of a narrow group of people but is gradually beginning to concern all of us. Just like sharing economy, which seeks to maximize the use of already existing resources. In the article, we examine the respondents' level of opinion on the sustainability of shared Airbnb accommodation. For data collection, we used a questionnaire survey, in which 546 respondents participated, and for the analysis of the obtained data, we used the sample statistics since, one-sample t-test and two-sample t-test methods.

The results showed that shared accommodation is more sustainable than traditional hotel accommodation. These manifestations can be observed mainly in the lower rate of energy or water consumption per guest night. We consider the rating system and possible negative reviews as the primary motivator. The application of such a system also in conventional types of accommodation would lead to an increase in the competitiveness of these accommodations from the point of view of sustainability. Despite the demonstrable sustainability of shared accommodation, we did not record a clear opinion among the respondents, but only answers pointing to an agreement with this statement rather than disagreement. Airbnb definitely has a lot to offer in terms of sustainability, but the communication is probably not so clear-cut, and therefore we recommend the company more intensive sustainability communication, which can lead to a further increase in interest in shared accommodation. We lastly recommend conducting similar research on other sustainability pillars to complete a picture of the sustainability of shared Airbnb accommodation in Slovakia.

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# ANALYSIS OF CORPORATE SOCIAL RESPONSIBILITY POLICIES IN THE CONSULTING AND COMMUNICATION SERVICES SECTOR

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## **Abstract**

The aim of this study is to present the results of research aimed at understanding how the postulates regarding Corporate Social Responsibility (CSR) are implemented by the largest companies in the marketing communication and consulting industry.

A literature analysis was carried out with particular emphasis on the results of the latest research conducted by leading commercial research institutes and the industry itself being analyzed. Based on the collected data, a comparative analysis of the surveyed entities was carried out based on selected criteria. It was assumed that the most up to date and accurate information can be obtained from the corporate websites of the selected companies. The expert review of the content available on the websites was conducted. In addition, an analysis of the volume of search results returned by Google was carried out.

The research results show that companies from the marketing and business consulting industry have developed policies in the area of CSR. However, the content expert analysis revealed that there are no fundamental differences in the degree and scope in which these policies are presented. As a result, all analyzed businesses seem to adopt very similar communication strategy when it comes to social responsibly.

In the light of the results of this research it can be said that that the corporate websites cannot be the only tool for assessment of the CSR policies, particularly when it comes to the more complex and moral matters. Analysis of the other content available on the internet should be added to get a better understanding of the importance of given content for a brand. Author recommends, and will continue, research to develop a more standardized and consistent approach for content analysis of the sources available online in area of CSR.

***Keywords:** corporate social responsibility, content assessment tool, communication and consulting firms, online content*

## **1 INTRODUCTION**

The global economy has experienced significant challenges in recent years. After years of relative peace, events such as the outbreak of a pandemic, climate change or the war in Ukraine have often forced enterprises to radically change their business models. One of the effects of these events is the turn of enterprises towards the consumer, getting closer to clients' needs not only in the transactional sphere, but also in the human and social sphere.

These unexpected, unprecedented, and rapid changes in the business environment, make the matter of Corporate Social Responsibility (CSR) increasingly important. Also, we have been observing an immense growth of content about CSR generated by corporates that is available online which makes it difficult for consumers and customers to access reliable information. In this respect, a more serious scientific discussion should be conducted, which will allow the development of tools enabling a more effective classification and evaluation of activities undertaken by enterprises versus declarations made in their policies. As a result, there is a need to constantly update and revise the approach to understanding of communication of the CSR policies.

There is much research from the B2C market that confirms that consumers prefer to interact and engage with brands which are legitimately socially responsible (Wunderman Thompson, 2022). Selected results are presented in the following sections. However, in this article, the focus is on the B2B sector, to be precise business consulting and marketing communication services. This market has confronted a major transformation in recent years. To survive and remain competitive old players were forced to adapt to new trends and new commers had to find a place in this well-established market.

A top 14 global companies communication and consulting global companies were selected and assessed to see how these companies encompass a strategic shift toward a socially responsible business. How this strategy is adopted by these companies which are on many occasions responsible for strategy creation for other businesses? In this research we looked at the key players in the consulting and communication services providers to understand what approach they take in their own business strategies to embrace a change toward Corporate Social Responsibility. We try to understand if an approach toward socially important issues can be a differentiator, and value creation factor in a highly competitive B2B professional services industry (Bocken et al., 2014). A challenge for companies is not only if they really comply with the policies but how communicate this to target audience in an effective way. The internet is the most accessible medium and a key communication channel for brands and assessment of a value of the content available has become a critical issue.

## **2 THEORETICAL BACKGROUND AND LITERATURE REVIEW**

Corporate Social Responsibility is not a new trend. First articles were published in the 1970s whereas publications on other related subjects as Corporate Sustainability, Environmental Management. Corporate Social Performance became appearing in the 1990s and latter. New, more specific terms gained popularity but overall trend in publications on this matter has been steadily growing (Montiel, 2008). However, the origin of CSR can be tracked back to the time of the Great Depression and the discussion between Berle and Dodd published by the Yale Law Review (Sheehy, Farneti, 2021).

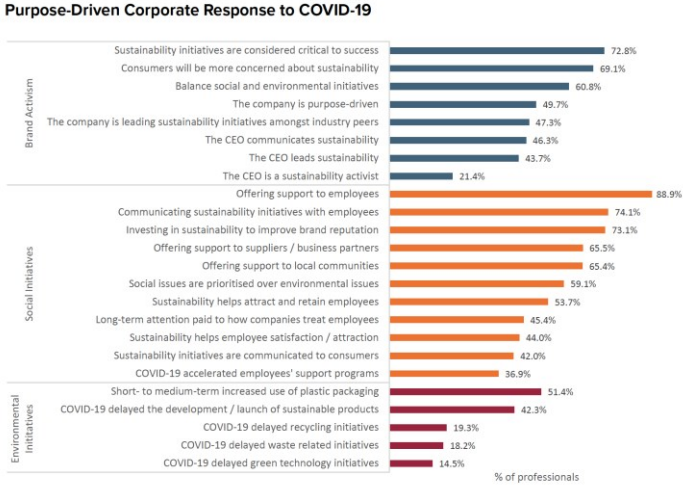
One of the most concise definitions of the CSR was coined by Purcell in 1973. CSR is when a company can acknowledge and response to issues beyond narrow economic, technical, and legal requirements (Purcell, 1973). Many definitions of CSR have been discussed and there is no clear difference among related terms (van Marrewijk, 2003) but for the purpose of this paper a definition created by the European Commision can be considered best fitted - CSR is the process. whereby enterprises integrate social, environmental, ethical, and human rights concerns into their core (EC Communication, 2011).

When analyzing results of the recent market research one of the key drivers for companies to focus more on social responsibility is a growing demand from the consumers. *Top 10 Global Consumer Trends 2021* report published by Euromonitor International predicted that one of the key emerging consumer trends in 2021 was to focus on environmental issues. Consumers demand that businesses truly care beyond revenue and should take an active role in reshaping the world in a more sustainable way. (Westbrook, Angus, 2021). Sustainability initiatives are considered critical to success according to nearly 73% of interviewed professionals. “*The Future 100: 2022*” report (Wunderman Thompson, 2022) released by the communication and consultancy agency Wunderman Thompson supported this statement also forecasting this trend to be dominating in 2022. Sustainability and social responsibility should not only be a chapter in a company long-term strategy policy book but to be successful companies need to prove their commitment. More and more companies not only adopt certain policies and procedures but also transform their business models to be truly more socially responsible. In fact, we observe that

new many new companies are born because of a shift from a volume-driven to a value-driven economy and combating social inequalities and drawing attention to unfavorable changes taking place in the natural environment. Decades ago, brand lobbying had negative connotations as large oil, tobacco, alcohol, and other companies used this practice in morally questionable ways. (Kotler, 2021). Over the years, it has been observed a change the way brands behave and there are numerous positive examples of brand activism. As a result, 86% of consumers expect brands to take a stand on social issues (Shelton Group, 2018). Another research conducted by a communication and consulting firm Wunderman Thompson let us understand better shopping consumer behavior. According to research as much as 67% of respondents said that a company’s ethics matters when making purchasing decisions (Wunderman Thompson, 2021). Further important insights into consumer actions can be learned from a report published by Publicis Sapient. According to this publication nearly half (49%) of household decision makers for technology products and services, declared that would be willing to pay 10-15% more for products made in an environmentally friendly way. Furthermore, 54% of surveyed participants declared that they are ready to pay higher prices for recyclable products.

When discussing this issue, it is also worth referring to the idea of a business model, which describes the rationale behind the way in which the organization provides three value and ensures and benefits from this generated value (Osterwalder, Pigneur, 2010). A purpose driven business model is applied by companies that see CSR as a fundament of the business strategy and a key differentiator. It appeared in early XXI century in the era of the so-called Marketing 3.0 (Kotler, 201). The purpose driven business model is an approach in which the company's goal is more than increasing its value. Enterprises should also play an active role in society initiating and supporting actives that go beyond usual business objectives. Gradually, over the past few years, the pressure to increase corporate social responsibility has forced many enterprises to accept these demands and included them in their corporate strategies.

This pressure even accelerated because of recent developments and events. One of them is a pandemic Covid-19 that had, and in many cases still have, a significant impact on business in many areas. According to Euromonitor research (Figure 1) 69% of professionals expect consumers to be more concerned about sustainability than they were before COVID-19. Interestingly, only 50% of professionals believe their company is purpose-driven (Westbrook, Angus, 2021).



Source: Euromonitor International Voice of the Industry: Sustainability Survey, fielded June 2020

Fig. 1 – Top 10 Global Consumer Trends 2021. January 2021.Euromonitor International

Meanwhile, the report on research done on over 65k business executives, commissioned by a technology company Microsoft, reveals a role of genuine engagement of high-level executives in sustainability issues. Farsighted business leaders understand importance of the sustainability agenda by integrating sustainability into the customer journey, while ensuring business targets are realistic while ambitious (Microsoft, 2021).

### 3 METHODOLOGY

To assess how global companies in the consulting and communications industry communicate their corporate social responsibility policies and understand if these businesses can build their strategy on a purpose-driven business model the right research group had to be selected. It was decided that a reliable source can be retrieved from a renowned commercial research organization.

Forrester is a leading global market research company that provides research, intelligence, and consulting services (Forrester, 2022). It is globally recognized as one of the leading providers of different business and market analysis and reports. One of them “*The Forrester Wave™: Global Digital Experience Services, Q2 2022*” (Forrester, 2022) was chosen as a base for further research. This is the most recent report about this specific industry listing all the companies that can be considered leading ones.

The selection of the participants for this publication was designed by the researchers from Forrester. The report assessed providers against 21 criteria covering three categories: Current Offering, Strategy, and Market Presence and 14 of them has qualified to the report. The contenders that are awarded highest scores are assessed as strong when they are particularly strong in many areas including customer experience strategy services, customer experience insights services, digital marketing strategy and implementation services and digital commerce strategy and implementation services. The results are presented in the form of a diagram illustrating how the analyzed entities were assessed in all categories. (Figure 2).



Fig. 2 – The Forrester Wave™: Global Digital Experience Services, Q2 2022. Forrester

Afterwards, a qualitative expert UX review of all 14 corporate websites was carried out to identify the content that could prove the position of the surveyed company on each of the following issues:

1. Position on the environment
2. Position on diversity and inclusion
3. Position on the war in Ukraine

The third step of research was an analysis of the search results given by Google for specific terms related to three investigated issues. The reason for the was the results from the qualitative expert UX review did not bring expected depth of understanding of the analyzed matter. It proved that the chosen research methodology is not sufficient to obtain the results of the desired value.

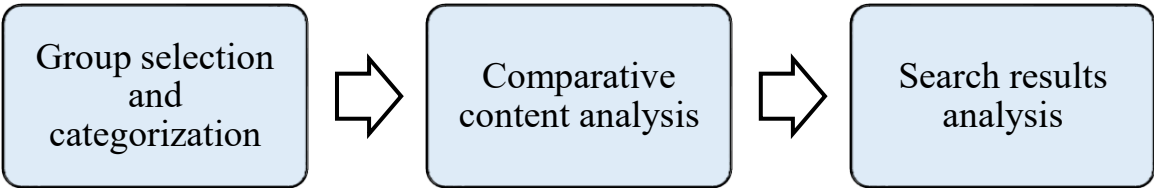


Fig. 3 – Research process. own research

#### 4 RESULTS

The first step of the analysis has shown that 6 of 14 companies are headquartered in Europe, 4 in USA, 3 in India and one in Japan (table 1). 12 companies have surpassed double-digit million-dollar revenues and number of employees range from 46k to 699k. Although the choice of the analyzed companies did not depend on their size, but their innovation in providing expert services, it is worth noting that the roles of leaders are usually assigned to the largest and oldest organizations.

The last column is an attempt to assign a given company to a specific category, branch of services from which they originate or generate most income. Assignment to a given category is made based on a qualitative analysis of the history of a given company, the type of services offered, and the structure of revenues. And here the greatest correlation to the Forrester ranking can be seen – all leaders are well known and established businesses that have been leaders in their respective categories for many years. The core business for them is either advertising or finance and business consulting.

In the table below all 14 companies that were selected to the research are listed in alphabetical order. Also, the following information is included.

Tab. 1 – Understanding of the analyzed businesses. Source: own research

	Name	Headquarter	Revenue (US\$, 2021)	Established	Number of employees	Origin
1.	Accenture	Dublin/Ireland	50.5	1954	699k	Finance
2.	Capgemini	Paris, France	50	1967	340k	Finance

3.	Cognizant	Teaneck, USA	18.5	1994	318k	IT
4.	Deloitte	London, UK	50	1845	345k	Finance
5.	Dentsu	Tokyo, Japan	9,9	1901	46k	Advertising
6.	EPAM	Newton, USA	3.76	1993	61k	IT
7.	IBM	Armonk, USA	57	1911	282k	IT
8.	Infosys	Bangalore, India	16,3	1981	314k	IT
9.	Omicom Group	New York, USA	13,2	1986	64k	Advertising
10.	Publicis Groupe	Paris, France	11,5	1926	90k	Advertising
11.	PwC	London, UK	45	1998 (1854)	284k	Finance
12.	Tata CS	Mumbai, India	26	1968	530k	IT
13.	WIPRO	Bangalore, India	10	1945	230k	IT
14.	WPP	London, UK	61	1951	109k	Advertising

The next stage was an expert content analysis of the corporate websites. A simple Yes/No assessment checklist. Yes - if there is information found that can be considered as an opinion on the issues under investigation. No – it is a lack of a clear position. At this point, no qualitative content analysis has been performed.

Tab. 2 – Policies available on the corporate website. Source: own research

	Name	Position on the environment	Position on diversity and inclusion	Position on the war in Ukraine
1.	Accenture	Yes	Yes	Yes
2.	Capgemini	Yes	Yes	Yes
3.	Cognizant	Yes	Yes	Yes
4.	Deloitte	Yes	Yes	Yes
5.	Dentsu	Yes	Yes	Yes
6.	EPAM	Yes	Yes	Yes
7.	IBM	Yes	Yes	Yes
8.	Infosys	Yes	Yes	Yes
9.	Omicom Group	Yes	Yes	Yes
10.	Publicis Groupe	Yes	Yes	Yes

11.	PwC	Yes	Yes	Yes
12.	Tata Consultancy Services	Yes	Yes	Yes
13.	WIPRO	Yes	Yes	Yes
14.	WPP	Yes	Yes	Yes

Analysis of the content of the official websites of all subjects under study revealed that each company expresses its opinion and position in all three analyzed areas. Especially clearly, all enterprises declare their commitment to matters related to the climate crisis and the commitment to work to improve the current environmental situation. In most cases, this takes the form of clearly defined climate policies and goals. All companies declare to become climate neutral and to switch to renewable energy sources in the next few years. The current achievements are also presented and the company's and employees' commitment to environmental protection is reported. In this respect, we do not observe any significant differences when looking at the history of a given company, its size or the location of the headquarters.

The second area under analysis concerns diversity and inclusion. As in the previous category, also here all the respondents declare their commitment to creating an equal work environment for all. There is a difference, however, in the extent to which the different actors understand this commitment and how they communicate it. Companies with roots in the advertising, media and communications industries appear to be most committed to promoting diversity, not just equality.

The third issue is of a more political nature, but here too, each company has decided to take a position. However, in this area, the differences between the examined companies are more significant. The criterion that separates individual companies turns out to be the history and seat of the company. The company's stance on the war in Ukraine is usually like the stance expressed by a given state where the company is headquartered. Companies that are of European and American origin tend to take a firmer stance, including the fact that many have decided to shut down their operations in Russia.

The third step in this research was deeper content analysis that focused on the three policies. For the purposes of this study keyword research on Google was selected to see how many results a search engine returns for the same combination of a search phrase “*brand name + keyword*”.

Tab. 3 – Search results on Google.com for specific keywords as of 26.10.2022. Source: own research

	Brand + Keyword	sustainability	diversity and inclusion	Ukraine war
1.	Accenture	8 450k	3 130k	1 620k
2.	Capgemini	2 420k	334k	783k
3.	Cognizant	7 700k	2 180k	1 446k
4.	Deloitte	55 200k	22 300k	2 050k
5.	Dentsu	615k	136k	505k
6.	EPAM	241k	558k	96k
7.	IBM	47 400k	10 700k	3 760k

8.	Infosys	3 550k	1 490k	3 990k
9.	Omnicom Group	290k	106k	102k
10.	Publicis Groupe	624k	424k	1 050k
11.	PwC	17 600k	4 140k	2 290k
12.	Tata Consultancy Services	1 040k	1 090k	2 800k
13.	WIPRO	2 290k	1 140k	2 610k
14.	WPP	896k	207k	939 k

A search on Google revealed that the largest companies receive the largest number of publications. For all but two firms, a combination of a brand name and “*sustainability*” generates the most search results among three analyzed terms. For EPAM and Tata Consultancy Services “*diversity and inclusion*” is the most popular phrase. In 7 cases, each brand appears in search results most often in combination with a phrase “*sustainability*” followed by “*Ukraine war*” and followed by “*diversity and inclusion*” whereas for 6 “*diversity and inclusion*” appears more often than the “*Ukraine war*”.

## 5 DISCUSSION

The results of the study differ from the anticipated ones. It was expected that depending on the origin, size and seat of the company, we will observe some differences in the way given enterprises communicate their policy in socially significant matters. Meanwhile, the results of analyzes of the websites of all companies revealed that these differences were minor. A simple comparative content analyzes appeared to be insufficient to obtain valuable results. To obtain a complex view we need a more comprehensive and standardized approach for content analysis and comparison.

A challenge for this study is how to measure engagement in the social issues. Information publicly available on the website are always structured and presented differently. Website content and UX strategy is an important factor of an overall communication strategy. Expert review seems to be for now the most reliable research method. According to the Esrock and Leichty (1998) 82% of companies that had a website in 1998 also reported on social responsibility. It can be assumed currently a company official website should be a reliable source of information about social activities.



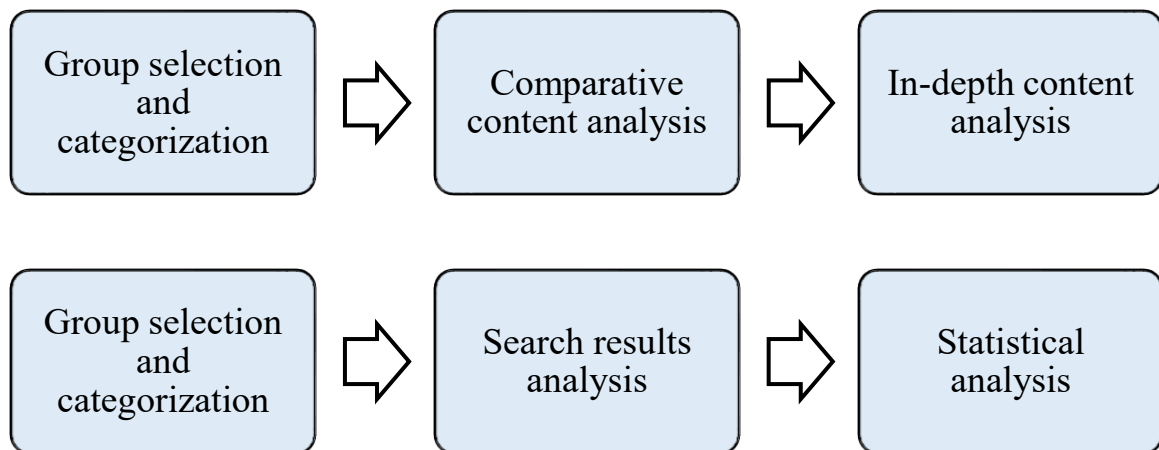


Fig. 4 – Advanced research process. own research

For the next stage of the study, we used the Google search engine. The companies own their corporate websites and fully control published content whereas they do not have such control over all other publications on the Internet. For this reason, volume of search results returned by Google can provide a more impartial view. For this paper a basic analysis of the results was made and in the next phase we plan to use other statistical methods that will allow us to better understand the relationships between data (Sułkowski et al, 2021).

In addition, to the quantitative methods the more in-depth qualitative content analysis should be conducted to discover sentiment (Zakrzewska-Bielawska, 2021). A sentiment analysis (NLP) technique can be used to determine whether if the value of the message communicated by the companies is positive, negative, or neutral. WPP, which has been the largest communication company in the world, received relatively low numbers of publications in a search engine result analysis. Interestingly, WPP was one of the first ones to announce that it will discontinue its operations in Russia in a show of support for Ukraine and the international community in condemning the Russian invasion (WPP, 2022). Also, during the most important creative industry event – Cannes Lions, WPP and the Ukrainian Government declared a partnership to attract investment into Ukraine to help reconstruct its economy (WPP, 2022).

Finally, we found that a method of the selection of the research group was appropriate, and reliance on the results of analyzes conducted by commercial research institutions such as Forrester can provide additional, valuable dimensions for further analysis.

## 6 CONCLUSION

Corporate Social Responsibility has been on an agenda for many years but due to the recent events the trend towards a truly responsible and sustainable business accelerated. Many companies are changing their business model, but also new ones are created based on a purpose driven business model or sustainability business model (Grabowska, 2021). Also, major communication and consulting companies are on the way toward being truly sustainable and standards are expected to be set in coming years – they follow a trend that we have been observing in recent years which is confirmed by both academic (Montiel, 2008) and commercial research (Euromonitor, 2021)

The study shows that leading consulting and communication companies give much prominence to sustainability and social responsibility matters on corporate websites. They expose their

orientation and pay attention to value creation that comes from being vocal about social issues. Even though all the analyzed entities show compliance with these standards, some of them seem to adopt more firm and unequivocal attitudes in some areas. This may be the factor that distinguishes them from their competitors. It can also be a signal for customers who are looking for a partner who share same values. We can therefore also witness a moment when the b2b sector will also deviate from purely business and commercial criteria when choosing contracts and pay more and more attention to social and environmental factors.

In the light of the obtained results, it can be said that not all three of the above-mentioned issues are treated equally by enterprises. The degree of involvement in each sphere is different. In general, the position on the environment is very similar for everyone. Differences appear in the moral sphere, here the degree of commitment begins to differ, and we observe even greater differences in political matters.

B2B companies need to pay close attention to how sustainability concerns influence behavior of their direct and non-direct customers (Jain, Lobo, 2012). Results of this study shows that leading communication and consulting professional services providing firms understand this well. They developed strategies and policies, and they seem to play an important role in the overall value creation strategy. Having said that, they seem to have a common and publicly expected point of view on environmental issues, whereas less radical in ideological and political issues. It is yet to be seen which approach will be better perceived by clients. A strong position on certain matters can be a strong differentiation factor, but it may also be a kind of barrier for more moderate-minded customers. However, long term it is crucial for brands demonstrate that they are credibly addressing the sustainability agenda and stand behind the declarative company's purpose.

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# CLUSTER ANALYSIS OF POTENTIAL HOTSPOTS OF DISCONTENT IN THE SLOVAK REPUBLIC

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## **Abstract**

The aim of this paper is to identify potential hotspots of discontent within Slovak municipalities by identifying similar regional conditions (demographic and socio-economic conditions) that are shared by voters. We believe that spatial localization of antisystem voters combined with the identification of similar characteristics and conditions that they share can contribute to current research. In order to do this, we employed cluster analysis with the K-medians method. For the purpose of cluster analysis, we have decided to use eight specific variables - average unemployment rate, average wage, share of minority population, share of religious population, density population, share of the population of the age 65+, share of population with lower educational attainment and share of population with university educational attainment, which were identified as crucial based on the latest literature. The results of cluster analysis help us to identify a specific cluster of municipalities that complies with all the assumptions of discontent. Therefore, we labelled this cluster as potentially very probable to be opted for anti-system voting. By comparing spatial distribution of municipalities gathered under this cluster and municipalities that voted for anti-system Slovak party we saw a similar pattern. We assume that high unemployment rate with lower average wage, lower population density and high share of citizens with lower educational attainment creates a condition that is being shared within the given cluster municipalities and leads to discontent. We believe that these results might be useful for policy making and implementation of lowering antisystem stances and attitudes by focusing specifically on hotspots of discontent and its specific characteristic of inequality and “left-behind” feeling.

*Keywords:* anti-system, cluster analysis, discontent, regional inequality

## **1 INTRODUCTION**

As antisystem parties promoting xenophobic, authoritative and nativist rhetoric are on the rise, research aimed at investigating this behaviour becomes important. According to Muller (2016) the rise of anti-system parties does not only pose a threat to liberal democracy, but to the democracy itself. From practical point of view Rodriguez-Pose (2018) suggests that these kinds of political shifts can have serious impact on economic and political system by means of bringing to life ineffective and insufficient policies. Scholars are mostly focused on the demand side of this issue regarding the drivers of motivation to vote for antisystem parties. Rodriguez-Pose (2017) in his work suggests that local economic conditions shape spatial voting patterns in such a way, that individuals living in places with certain specific spatial characteristics are more prone to anti-systemic voting. With this article we will try to contribute to current literature by testing these variables, that have been labelled as significant for antisystem voting and creating groups of voters that have the higher probability to vote for antisystem parties. We believe that this approach might help us to better predict stances and electoral behaviour of the voters located in certain areas. Thus, it may be argued that despite given political party's ideology might change or fade away and then again reappear, people's sentiments and unhappiness remain consistent under a range of conditions.

Therefore, in this article we would like to identify and capture where are the potential hotspots of discontent in Slovak republic, while taking into account spatial dimension. We consider

Slovakia as an interesting case for this purpose referring to Mudde (2007), as we might deal with the rise or downfall of certain antisystem parties. In this article we assume that parties can ideologically change, cease to exist as well as rise. Thus, it can be argued that while political parties are dynamic, changing, disappearing and emerging, people's discontent and attitudes remain static - unchanging - as a result of a number of factors we have assumed as crucial. For this purpose, we believe that it is important to analyse spatial dimension of conditions that create breeding ground for discontent. In order to do that we will use a cluster analysis. Cluster analysis will allow us to create certain groups of voters with common characteristics, and we will be able to see exactly where these clusters of voters are located.

## 2 THEORETICAL BACKGROUND

Current literature is focused on analysis of antisystem voting in terms of individual's feeling of discontent. The feeling of discontent is mostly linked to unequal distribution of financial resources. As van Leuween and Vega (2021) put it - the economic and political system is not working for everyone equally. Dijkstra et al. (2020) linked this discontent to regional factors, which might have a direct effect on individuals' perception of wellbeing. Rodriguez-Pose

(2017) further widens this presumption with the tag of such regions as - „places that don't matter". Rodriguez-Pose (2017) pointed out specifically to the discontent of the inhabitants of regions in economic decline, with persistent poverty and lack of opportunities. Becker et. al. al (2017), indicated that patterns of voting outcomes for the 'leave the EU' option, at the constituency level, coincided with deprivation in education, income, and unemployment. In the literature we can find categorizing of spatial patterns of voting as contextual and compositional factors (van Leuween & Vega, 2021). According to van Leuween & Vega (2021) there is a correlation between spatial mutual features and differences, discontent and antisystem voting. Rodriguez-Pose (2017) in his work suggested that local economic conditions shape spatial voting patterns in such a way, that individuals living in places with certain specific spatial characteristics are more prone to anti-systemic voting. For instance, the difference between larger agglomerations and rural areas in terms of population density seem to play one of the key roles in terms of discontent, which results in antisystem voting. Individuals living in rural places with lower population density might feel lack of respect, attention and unfair allocation of resources (Cramer, 2016). However, it should be noted that the significance of the effect between population density and anti-system voting has been confirmed mainly in America, while less significance has been identified while examining presumed relationship in Europe (Dijkstra, 2020). The industrial decline that is typical of cities that were once the key engines of national and regional economies but have been impacted by processes of globalization is also given attention. According to a study by Dijkstra et al. (2020), prosperous towns also display some anti-system stances when other factors like education, employment prospects, and industrial development are controlled, especially if they had previously experienced better times. Minorities might have played a role as well, according to Rydgren (2008) they are portrayed by anti-system parties as a threat to national identity, values, and material wealth. The theory of „halo effect" presumes that the share of minorities plays a role for anti-system voting especially in regions that are neighbours with regions with high share of minority population. This means that the breeding ground for the mobilisation of anti-system parties is not directly regions with higher minority populations, but regions that are neighbours to them, mainly due to the fear of losing social and economic status (Rydgren and Ruth, 2013). Research suggests that older age groups of the population are more tended to vote anti-system because of their frustration with failure to cope with economic change, immigration, and their orientation toward traditional values (Ford & Goodwin, 2014). For younger people, anti-systemic voting may occur due to copying their parents' anti-systemic attitudes (Coffé &

Voorpostel, 2010). Older studies presume only a small probability of the religious share of the population voting for the PRRP (Lubbers and Scheepers, 2000), as it is assumed that they will prefer Christian-oriented parties to the PRRP, which promote intolerant and xenophobic attitudes. On the contrary, the results of the current research show a significant positive relationship of religious populations to the choice of PRRPs, and especially in the CEE region (Zagorski & Santana, 2021; Voda et al., 2021). An explanation can be offered with reference to Ivarsflaten (2008), who surmises that this change has occurred due to increasing anti-immigration attitudes and sentiments. Individual voter dissatisfaction is translated into political dissatisfaction and expressed through the voting of anti-system political parties. The term 'losers of globalisation' is frequently used in research in this context. The question of who the winners and losers are has been answered by Kriesi et al. (2006) by pointing to the level of educational attainment of individuals. The winners of globalisation are highly educated entrepreneurs who benefit from international competition and the losers are low-educated employees who work in traditional sectors protected by the internal market and are directly threatened by the opening of borders.

When considering socio-economic dimension of antisystem voting, the most common explanatory variables included are unemployment and average income (De Blok & Van der Meer, 2018). The effect of unemployment on antisystem voting is explained through the economic uncertainty hypothesis. This hypothesis is associated with changes in the market over recent decades that have pushed a certain segment of the population into less stable economic position. These groups include the unemployed and those who are potentially at risk of unemployment (Halikiopoulou & Vasilopoulou, 2018). As a result, the growing insecurity associated with economic deprivation leads to greater support for antisystem parties. Dijkstra et al. (2020) named the factors based on previous research - lower education, higher age and lower income create a holy trinity for anti-system voting.

### **3 METHODOLOGY**

In this paper, we will use cluster analysis. This method aims to group or cluster the units in a population or a sample according to their degree of relative similarity with respect to several characteristics. There are different methods on how to provide this type of analysis, but we have chosen to use k-medians approach as we are dealing with some of the outliers within our dataset and we want to reduce their impact on the results. We decided to use five cluster specification, as it seems to capture significant difference between clusters and significant similarities within given clusters. Cluster analysis was done in two steps. Firstly, we have created clusters including socio-economic and demographic variables. We chose eight variables for the purpose of K-medians clustering, that were proven by current literature as crucial for regional discontent of voters. After describing results of cluster analysis, we will identify potential hotspots of discontent in Slovak municipalities. In order to prove our assumption, we will use LISA analysis of share of votes for anti-system Slovak party Ludova Strana Nase Slovensko (LSNS). LISA analysis as local indicator of spatial association enables us to identification of local patterns of spatial association or more precisely spatial autocorrelation. Spatial autocorrelation especially in terms of voting can be explained by two mechanisms. The first one is the direct mechanism that appeals to the fact that voting pattern arise from spatial variations in the socioeconomic conditions that people share (Pattie & Johnston, 1995). The second one referred also as direct, relates mostly to the fact that individuals in a given space form social networks, interact and discuss policy issues (Books and Prysby, 1991; Huckfeldt & Sprague, 1995). By using the combination of cluster analysis and LISA analysis we will focus on the direct mechanism. We identify Ludova Strana Nase Slovensko (LSNS) as anti-system based on data of Expert Survey of Chapel Hill 2020 (high ranks in anti-establishment salience, position on

people vs elected representatives). Based on the cluster analysis we then have tried to identify which of the municipalities could create potential hotspots of discontent. We believe that this methodological approach will help us to create more stable predictors of electoral behaviour of voters with different characteristic in form of constituencies.

### 3.1 Data

In this article we decided to use specific eight variables referring to demographic and socio-economic variables that were identified as important for anti-system voting in the previous research, which we described in the literature review part of this article (see Tab. 1). We have gathered them from Statistical office of Slovakia and Population and Housing Census 2021 on the LAU2. To be more transparent about specific variables:

*Average unemployment rate* is the average unemployment rate that has been calculated in the period of 2016-2020.

*Average wage* is the average wage that has been calculated in the period of 2016-2020.

*Share of low educated population* has been calculated as the share of the population without secondary education with a matriculation diploma.

*Share of high educated population* has been calculated as the share of the population with a university degree.

Descriptive statistic of given variables can be seen in Tab. 1.

Tab. 1: Descriptive statistic of variables. Source: own research based on data from ŠÚSR and Population and Housing Census in 2021

Variable	min	max	median	mean	Standard deviation
Average unemployment rate	2,63	18,92	6,84	8,36	4,46
Average wage	769,6	1576,22	987,6	999,55	119,081
Share of religious population	0	100	86,428	83,93	11,89
Share of minorities	0	97,47	5,18	17,28	25,48
Population density	0,21	1721,57	58,64	90,87	119,169
Share of population 65+	2,068	55	17,18	17,359	5,047
Share of low educated population	14,056	78,571	44,459	45,020	9,09
Share of high educated population	0	40	11,96	12,24	5,46

## 4 RESULTS

In this section we will present outcomes of our cluster analysis. Results of the K-medians cluster analysis is inserted in Annex 1. As we can see on the Fig. 1 we have divided municipalities in Slovakia into five clusters based on the 8 variables. Variables are based on the literature linked to anti-system voting: average unemployment rate, average wage, share of religious population, share of minorities, population density, share of population 65+, share of low educated population and share of high educated population. We can further identify groups of votes with similar socio-economic and demographic characteristics in the group by further examination of following clusters:

### Cluster 1



This cluster of socio-economic and demographic variables is characterised by lower rate of average unemployment, higher average wage and relatively high share of religious population. On the other hand, it has a lower share of minorities. This cluster is identified by municipalities with lower population density. There is relatively higher share of people of age 65+. In case of educational attainment there is a large proportion of population with lower educational attainment and average share of population with university educational attainment. As we can see on Fig. 1 municipalities of this cluster are located on the fine proportion of Slovakia, but mainly in the central and western part of the country. Cluster 1 and its assigned municipalities with specific characteristic creates the larger cluster among all the others.

### **Cluster 2**

Cluster 2 is identified by a higher share of unemployment and relatively lower average wage. There is a significant share of religious population with lower share of minorities. In the cluster 2 we can find municipalities with lower population density. There is relatively high share of older inhabitants (65+). Compared to cluster 1, cluster 2 has lower share of population with lower educational attainment and higher share of university educated individuals. On Fig. 1 we can clearly see the distribution of the given municipalities on the east of Slovakia.

### **Cluster 3**

Cluster 3 shows the lowest average unemployment rate. The highest share of average wage in comparison to other clusters. There is also a lower share of religious population and lower share of municipalities. In case of cluster 3 there is a clear distinction compared to other clusters in terms of municipalities with the highest population density. It is probable that it grouped larger cities. There is relatively low share of older citizens. In case of education there is the lowest share of population with the lower educational attainment and the highest proportion of university educated population. On the Fig. 1 we can see that municipalities in this cluster are evenly distributed across Slovakia and they do not create any specific place-based pattern. Even though, their presence is mostly evident in the west part of Slovakia around and in the location of capital city of Slovakia – Bratislava and in the east part of Slovakia – in the vicinity of Košice.

### **Cluster 4**

Cluster 4 is very comparable to Cluster 2, as there is a high unemployment rate and low average wage. Compared to Cluster 1 there is a lower share of the religious population, but still one of the highest among all clusters. What differs this cluster from Cluster 2 is the share of minorities, which is much higher in the case of Cluster 4 but compare to Cluster 5 is still relatively small. Within all five clusters, Cluster 4 was assigned municipalities with the lowest population density. There is a lower share of the older population. But there is a significant difference in the level of population with less educated individuals, which makes this cluster of municipalities the most uneducated. There is also a very low share of university educated citizens. These characteristics make Cluster 4 the most prone to breeding ground of anti-system vote due to discontent. Municipalities assigned to Cluster 4 are mostly located in the south of central Slovakia and some parts of the East of Slovakia.

### **Cluster 5**

Municipalities in Cluster 5 have relatively higher average unemployment rate and lower average wage. There is a significant share of religious population, but what makes this cluster different to others in the highest share of minorities. Municipalities of this cluster are less populated and have relatively high share of older citizens. Municipalities under Cluster 5 have large share of lower educated citizens and relatively lower share of university educated citizens. Fig. 1 suggest that municipalities in Cluster 5 are mostly located at the South of Slovakia.

Taking into account the highest share of minorities, it is very likely that these municipalities are mostly inhabited with the Hungarian minority.

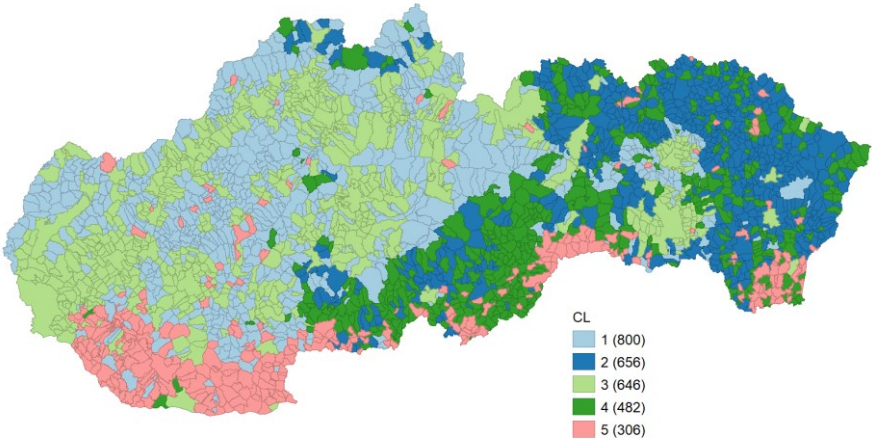


Fig. 1: Spatial visualisation of clusters 1-5 on municipality level. Source: own research in GeoDa, based on data from ŠÚSR and Population and Housing Census in 2021

We identified Cluster 4 as the cluster with the highest probability of inclining to anti-system voting. We can see on the Fig. 2 spatial distribution of the votes for anti-system party, to be more precise - populistic radical right party LSNS. Based on this LISA cluster analysis we can see that patterns in spatial distribution are very similar to distribution of municipalities assigned to cluster 4 in Fig. 1.

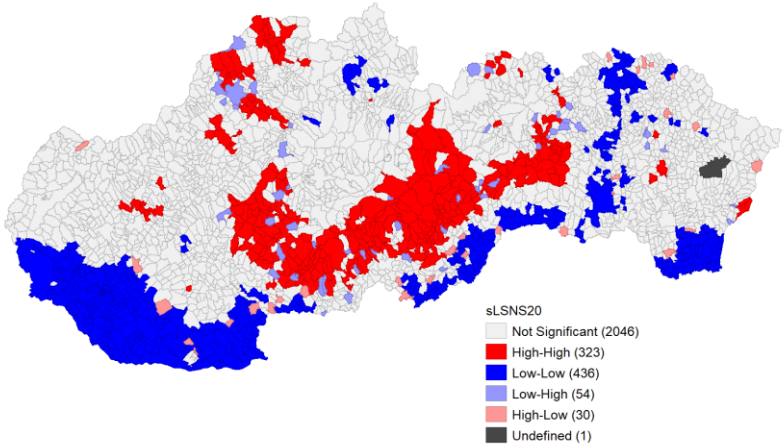


Fig. 2: Cluster map of share of votes for LSNS based on LISA analysis. Source: own research in GeoDa, based on data from ŠÚSR and Population and Housing Census in 2021

## 5 DISCUSSION

Based on our cluster analysis we were able to identify five clusters of municipalities, which differs in socio-economic and demographic characteristic of the population but are very similar

within clusters. Based on our literature review we could identify that Cluster 4 has the highest probability of concentrating citizens with discontent. We could see that there is the highest rate of average unemployment and the lowest average wage in that cluster. Higher share of religious population and relatively high minority population compared to Cluster 1, 2 and 3. Municipalities in Cluster 4 lack population density, and these municipalities consist of lower educated citizens. All these factors create breeding ground for discontent and anti-system voting. We could partially confirm this assumption with the LISA analysis of share of votes for anti-system party LSNS, where there is a very similar pattern of distribution of votes for LSNS (Fig. 2) and distribution of municipalities linked to Cluster 4. Moreover, based on LISA analysis we could identify that there is spatial autocorrelation in voting for LSNS which is also confirmed with Moran's I (0,464). With our cluster analysis we could confirm the first direct mechanism, that voters in Cluster 4 share similar socio-economic conditions and are very similar within their demographic characteristic. Based on literature review, we presume that if there will be any downfall within municipalities in Cluster 2 in the share of university educated citizens or rise in the share of lower educated population the probability of anti-system vote will be very high. These results seem to be in line with presented literature and lower population density, lower educational attainment, lower wages, higher rates of unemployment and relatively religious population are drivers of antisystem voting. In the case of minorities in our identified hotspot of discontent (Cluster 2) there is a lower level, which is very similar finding to Rydgen and Ruth (2013). Our finding in the case of older population (65+) is different compared to the findings of Ford & Goodwin (2014) as in Cluster 4 was the lowest representation of older population.

## 6 CONCLUSION

The aim of this paper was to identify potential hotspots of discontent within Slovak municipalities. For this purpose, we used cluster analysis using K-medians method. This helped us to group municipalities in a way that municipalities in the same cluster were more similar to each other than those in other clusters. To make this possible we chose 8 variables which we considered important for clustering based on the literature and factors of regional discontent of voters. Based on the results we have identified Cluster 4 as being the hotspot of discontent, which we later confirmed with LISA analysis when comparing the patterns of clusters of spatial autocorrelations of votes and spatial distribution of municipalities of Cluster 4. We assume that high unemployment rate with lower average wage, lower population density and high share of citizens with lower educational attainment creates a condition that is being shared within the Cluster 4 municipalities and leads to discontent. We find this spatial identification of hotspots based on regional factors important, as there is a solution in place-based policy which can prevent spread of discontent and focus on given issues of the municipalities which share the same uneven conditions. The shortcoming of these results lies in the data sample as we were able to test only for aggregate data on the municipality level. More sufficient estimations could be provided by cluster analysis on individual level of the voters, while including more variables which would reflect on the problem of objective inequalities.

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# GENERAL PRACTITIONERS AS GATEKEEPERS TO SAVE HEALTHCARE EXPENDITURE: EVIDENCE FROM SLOVAKIA

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## Abstract

This research deals with the important role of general practitioners in the healthcare system as gatekeepers to specialized outpatient care. We explore the impact of patients' and GP's characteristics on the incidence of referral to specialists in the healthcare system in order to find out key indicators for a gatekeeping reform in Slovakia. Using age standardization and linear regression, the study shows the effect of referral incidence on healthcare expenditure. We used data from a healthcare insurance company in Slovakia of patients' healthcare claims and their characteristics as age, sex, patient address, healthcare provider address, and visited specialties by the patient. Higher referral rate and strain difficulty, lower age of general practitioners are present in districts in east Slovakia while the opposite is present in the west of Slovakia. Our findings indicate that higher referral rates lead to higher healthcare expenditures. The linear regression model confirms the negative effect of the age of general practitioners and the positive effect of strain difficulty and costs above capitations to referral rates. Our study offers insight into the allocations of healthcare resources and how to better design the role of the general practitioner in the healthcare system.

**Keywords:** *gatekeeping, general practitioner, healthcare system, specialized outpatient care, incidence of referral, health expenditures*

## 1 INTRODUCTION

A general practitioner (GP) stands as a gate to the healthcare system. GP's diagnostic potentialities are often limited as not all of them have a complement of hospitals, laboratories, and specialists behind them. GP decides whether and where to send a patient.

A practical general clinic, as the first point of contact for a patient seeking healthcare, knows the patient's medical history and has the potential to have a complete picture of the patient's health. This places general practitioners in the role of appropriate gatekeepers, deciding on the recommendation and approval of further healthcare for a patient.

In healthcare, gatekeeping means broader competencies of general practitioners and the incentive of stricter assessment of patients in general practitioner clinics when referring them and sending them to specialized outpatient and hospital care. Gatekeeping is frequently perceived as lowering healthcare service use and healthcare expenditure.

If the healthcare system has no GPs, it would likely collapse, and if GPs are included within the healthcare system with no serious competencies, it would likely be expensive and inefficient, and it would mainly reduce the quality of life of patients. Healthcare systems with more than 30% GPs are more efficient (Blöndal & Ásgeirsdóttir, 2019). The patient can lose the most, namely, the manager of his medical care, and the company will replace him with the management of insurance companies, where the goals of these systems can be significantly different.

Many gatekeeping studies focus on the macro view of healthcare spending. Few studies in the literature address gatekeeping from the perspective of GPs and micro data on patients. Our study focuses on gatekeeping from the perspective of doctors and patients and their selected characteristics.

In this study, we explore the impact of patients' and GP's characteristics on the incidence of referral to specialists in the healthcare system in order to find out key indicators for a gatekeeping reform in Slovakia. Gatekeeping reform identifies what factors GPs consider when referring to specialists and describes how this differs between gatekeeping and non-gatekeeping systems. Using age standardization and linear regression, our study shows the effect of referral incidence on healthcare expenditure. This leads to potential savings in healthcare expenditures in the healthcare system. Considering all of these factors, the primary hypothesis asserts a higher referral rate leads to higher expenditures. The secondary hypothesis states that the characteristics of GPs and patients have an impact on referral rates.

The rest of this article is organized as follows. In the second section, we describe a gatekeeping background with a literature review, the third section illustrates our model and data description, the fourth and five sections present results and discussion, and in the final section, we draw our conclusions.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

Primary care is basic main healthcare, which for the client, family and community represents not only the first level of contact with the healthcare system but also continuous access (Kringos et al., 2015). People often go to GPs with a problem, not a solution. Many times, they find what they need by themselves. A large part is satisfied when they receive guidance to treatment or correct diagnosis. Sometimes they do not know what the treatment or diagnosis options are (Zermansky, 2016).

Building an efficient gatekeeper-based healthcare system has implications for healthcare costs and is an important topic for policymakers and professionals in healthcare (Liddy et al., 2014). Increasing costs of healthcare as well as the effectiveness of spending, which concerns governments around the world, may be a potential benefit of the gatekeeping system (Rotar et al., 2018; Collyer et al., 2017; Nelson & Wilson, 2018; Schultz, 2016). With limited healthcare, gatekeeping by general practitioners might reduce the referral rate to advanced care (Kaneko et al., 2019).

Nevertheless, there are countries worldwide with free-access healthcare where patients do not need a referral from a general practitioner to access advanced care (Schmalstieg-Bahr et al., 2021; Sakamoto et al., 2018).

A systematic review of studies addressing the impact of gatekeeping on patients and resources found a meta-analytic association of gatekeeping health systems with better quality of care, fewer hospitalizations, and lower healthcare costs. Patient satisfaction was lower in countries where gatekeeping was introduced, probably due to the lack of opportunity to directly visit specialized clinics (Sripa et al., 2019). A 40-year comparison of OECD countries showed a lower expenditure on the healthcare system in countries that had established gatekeeping in the primary sphere compared to countries where residents had direct access to specialist doctors (7.8% vs. 8.6%) (Anderson et al., 2000; Boerma et al., 1997). A regression analysis performed on the costs of outpatient clinics in eighteen OECD countries showed a statistically significant effect of gatekeeping on slowing down the growth of healthcare costs (Delnoij et al., 2000). A study from Germany also indicates significantly lower costs for patients in the gatekeeping model (Schneider et al., 2016). Patients enrolled in the primary care gatekeeping system have lower mean annual total healthcare expenditures than patients in the system without gatekeeping (Pati et al., 2005). Including collaborative care elements in the gatekeeping system can positively affect costs for mental health (Engels et al., 2020).

Gatekeeping often comes with positive as well as negative outcomes from various countries as their strictness of gatekeeping regulations has wide variations (Greenfield et al., 2016). Gatekeeping leads to higher coordination of care and improved quality. On the other hand, it increases ambulatory costs (Hofmann & Muehlenweg, 2016). However, a similar study shows that gatekeeping leads to avoidable hospitalization, which might be more expensive and potentially reduce the effect of higher ambulatory costs (Szecsenyi, 2016). On the contrary, a study from Switzerland shows a non-significant increase in hospitalization (Schwenkglenks et al., 2006).

Even though gatekeeping pilot in China shows significantly higher ambulatory visits in primary care, an increase in ambulatory costs in primary care provides little evidence. Reduction in hospitalizations and ambulatory visits at hospitals have a significant impact (Xu et al., 2020). Continuity of care leads to significant benefits such as fewer inpatient visits, shorter length of stays for these visits, lower readmission rates, and also results in a reduction in wasteful use of resources (Ahuja et al., 2020). Gatekeeping reform in France shows a slight but significant decrease in specialist visits (Dumontet et al., 2017).

A questionnaire survey among policyholders of private insurance companies in the Netherlands showed more frequent bypassing of general practitioners, when communicating with a specialist, in urbanized areas. The authors of the article attribute this effect to the higher education of this population and discuss the impact of education on the quality of communication during patient consultations with specialists (Kulu-Glasgow et al., 1998).

When implementing 'gatekeeping' motivation for practical general clinics, to reduce unnecessary visits to specialists, it is necessary to proceed together with the expansion of competencies, the creation of new procedures in treatment and prevention, the support of the second and third specialization of doctors, and education among general practitioners. In 2021, a survey was conducted among general practitioners in Indonesia, which revealed an association between doctors' positive attitude towards gatekeeping and their performance as gatekeepers (Mulyanto et al., 2021).

### 3 METHODOLOGY

We used data from a healthcare insurance company in Slovakia with approximately 2.5 million patients' healthcare claims and their characteristics as age, sex, patient address, healthcare provider address, visited specialties by the patient, whether they pay healthcare insurance or not, or their costs in the healthcare system. This information helps us to evaluate patients' difficulty for the insurance company in a way of illnesses, indicated by variable strain difficulty, which is the sum of the risk indices per patient. Computation of strain difficulty is aligned with valid legislation of Slovakia for the year 2019. We study the year 2019 to avoid the impact of COVID-19. If we use data from the COVID-19 pandemic, it could bias our results as a lot of people were visiting new specialties due to difficulties caused by the coronavirus.

We introduce the linear regression model to examine the effect of covariates on the special metric of sending to specialized outpatient care (SOC). We accomplish the estimated coefficients of covariates by means of OLS method. The linear regression model is given by:

$$= \beta_0 + \sum_{i=1}^k \beta_i X_i + \varepsilon \quad (1)$$



where  $y$  is the metric of sending to SOC after age standardization,  $X$  is a  $k$  dimensional vector of exogenous control variables including strain difficulty of patients, costs above capitation and mean age of GP, and a constant term. We used logarithmic transformation for the number of clinics at the address and the difficulty of the strain.

A visit to a new specialty is a visit to the SOC specialty, where the patient does not have a single visit in the previous calendar year. When calculating, it is necessary to take two ambulances of the same expertise in different company registration numbers (CRN) as one SOC expertise.

We are aware that not every visit to a new specialty has to be recommended or approved by a general practitioner. We consider this deviation to be uniform for all GP ambulances and therefore we do not have to deal with it when comparing ambulances.

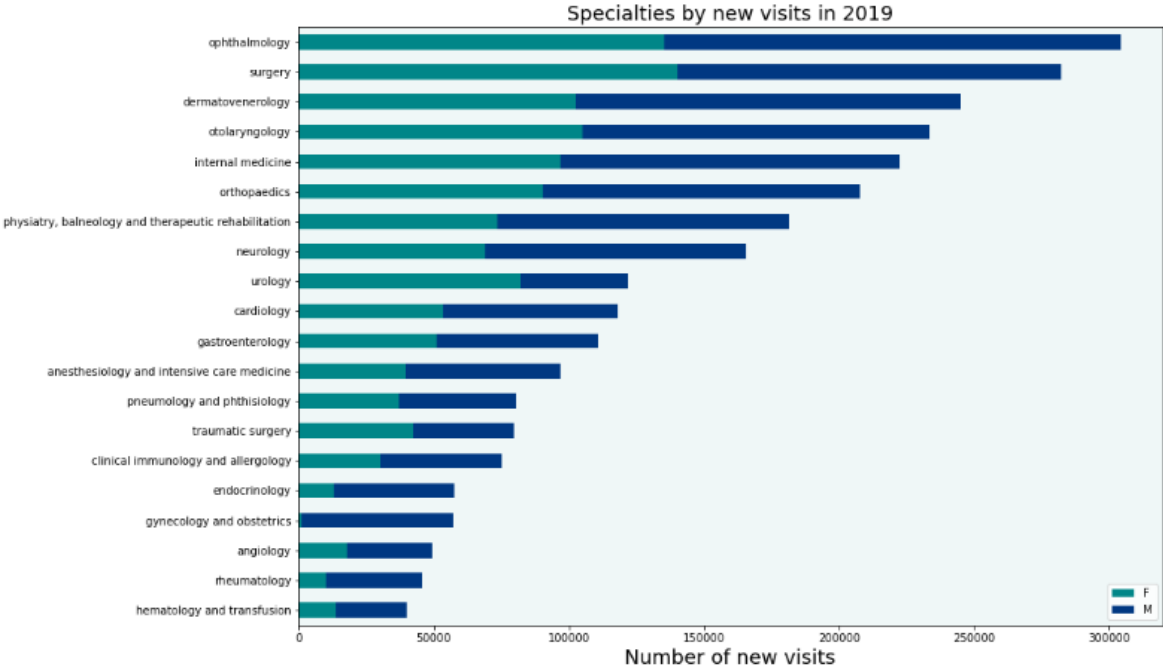


Fig. 1 – Distribution of new specialties by sex (F-female, M-male) in 2019. Source: own research

There are some specialties, which just need a doctor’s recommendation. We decided to remove these occurrences from our data as according to Fig 1., the amount of these specialties could bias our results. This includes specialties in ophthalmology, surgery, dermato-venerology, injury surgery, gynecology, and psychology.

The age of patients could be a factor, which will significantly affect sending to the specialist, and those GPs with older patients would be always displayed as bad ones. We can see the effect of age in Fig 2.

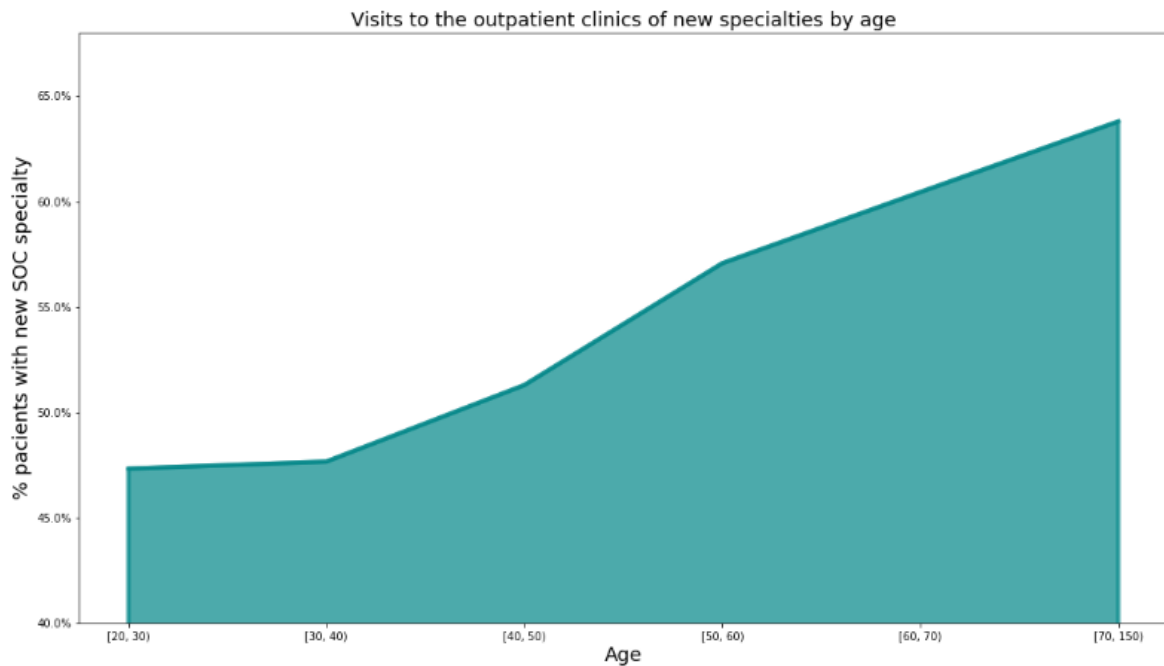


Fig. 2 – Visits to the outpatient clinics of new specialties by age. Source: own research

Epidemiological statistics offer a solution to this problem in the form of age standardization. After defining the standard composition of the population, in our case, the capitated population of individual dispensaries, the investigated metric for each dispensary is recalculated according to the standard population. Differences in the number and age structure of patients are thereby filtered out. The compared numbers thus realistically capture the influence of other factors specific to individual clinics.

We will add age cohorts to the data. Ideally at intervals of 5 or 10 years. We will then calculate the basic representation of these ages in data. We multiply these percentages by the size of the standard population chosen by us, e.g. 1000 or 100,000. This gives us the distribution of age cohorts in a standardized population.

We will choose the measure on which we will recalculate the effects when applying the standard population. This measure must be of binary type (yes vs. no, 1 vs. 0, etc.). We also have to design a variable that will serve as groups (healthcare providers) for which the average of the selected measure will be converted to a standardized size.

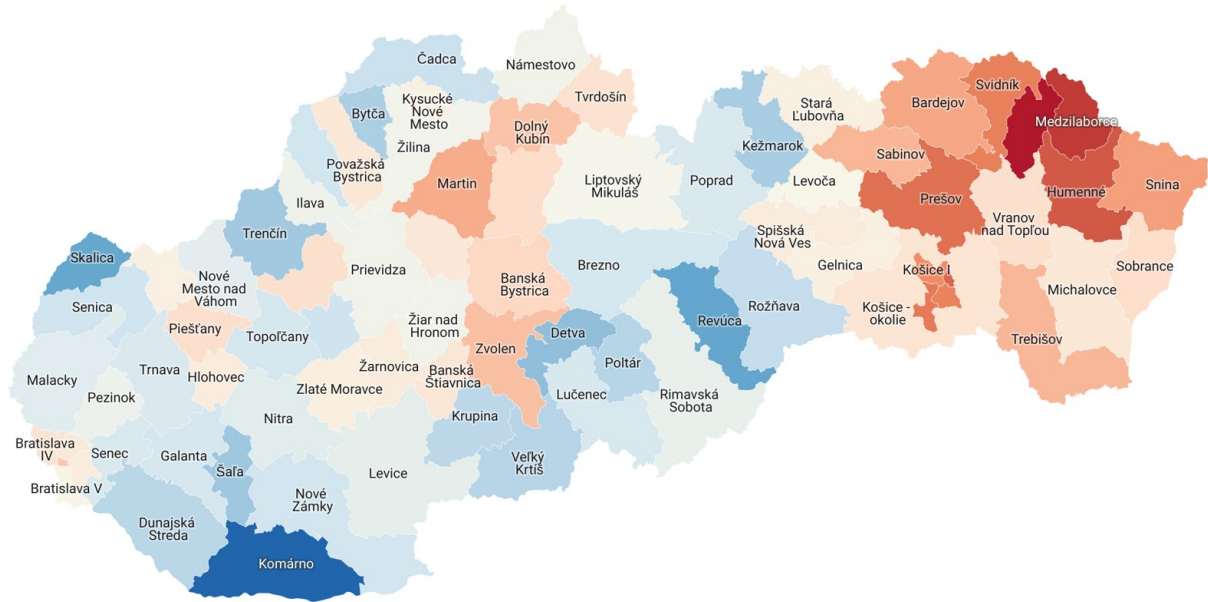
As a final step, the numbers of the given age cohorts in the standardized population multiply this average.

## 4 RESULTS

First, we apply age standardization using 10-year age cohorts to calculate referral rates to the specialist, which produces standardized referral rates. Fig. 3 shows standardized referral rates for each district in Slovakia. We can see the lowest rate in Komárno district and the highest rate in Stropkov and Medzilaborce districts.

### Standardized referral rate with at least one new SOC specialty

Per 1,000 inhabitants of the standard Slovak population  
486 620



Map data: ZBGIS® · Created with Datawrapper

Fig. 3 – Standardized referral rate with at least one SOC specialty by districts in Slovakia. Source: own research

We perform an explanatory analysis of variable referral to specialists, which histogram is illustrated in Fig. 4. The right part of the histogram indicates a significant number of GPs over the median referral rate.

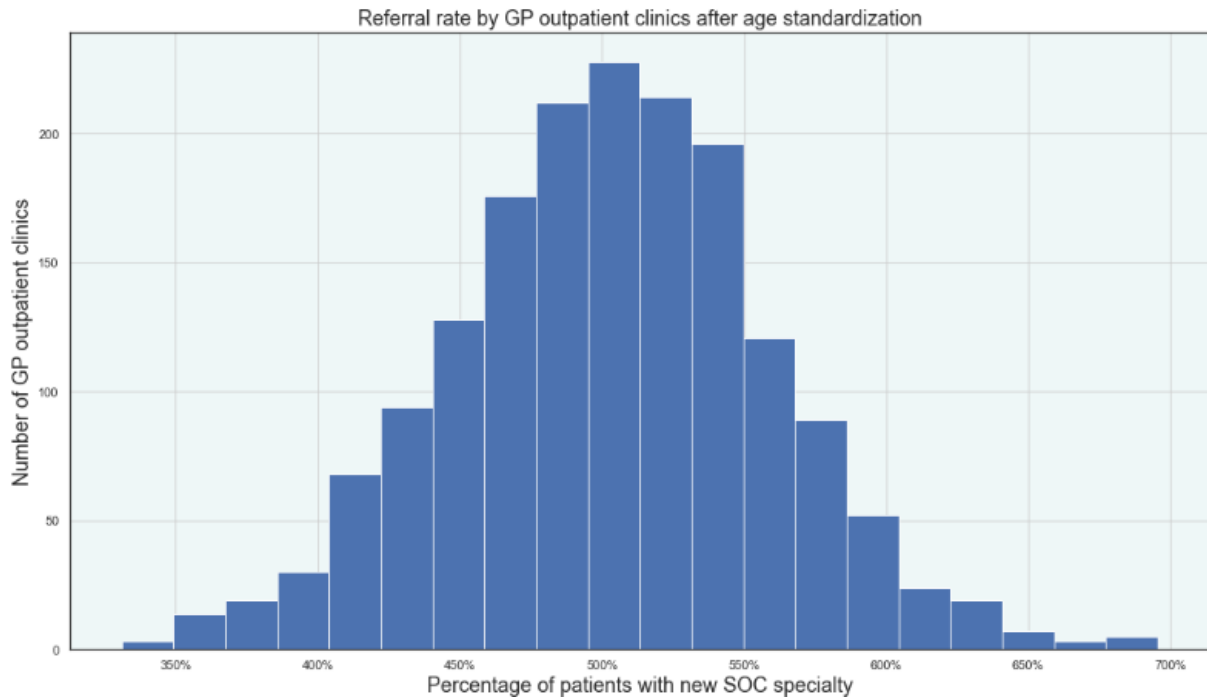


Fig. 4 – Referral rate by GP outpatient clinics after age standardization. Median is 50.33%. Source: own research

We looked at the impact of referrals to specialists on the average costs of a healthcare facility per patient. After removing facilities with less than 300 patients that could cause deviations, we divided the health facilities according to a standardized referral metric to SOC. We split GPs

into bins based on referral rate: 0-40%, 40-45%, 45-50%, 50-55%, 55-60%, and above 60%. We calculate the average costs per patient in the following way. First, we determine all GPs who meet the condition for a given standardized referral rate interval and then calculate the average costs per patient for 2019 for these GPs. Fig 5. shows average costs increase in these intervals, so patients referred more often to specialists cost more on average.

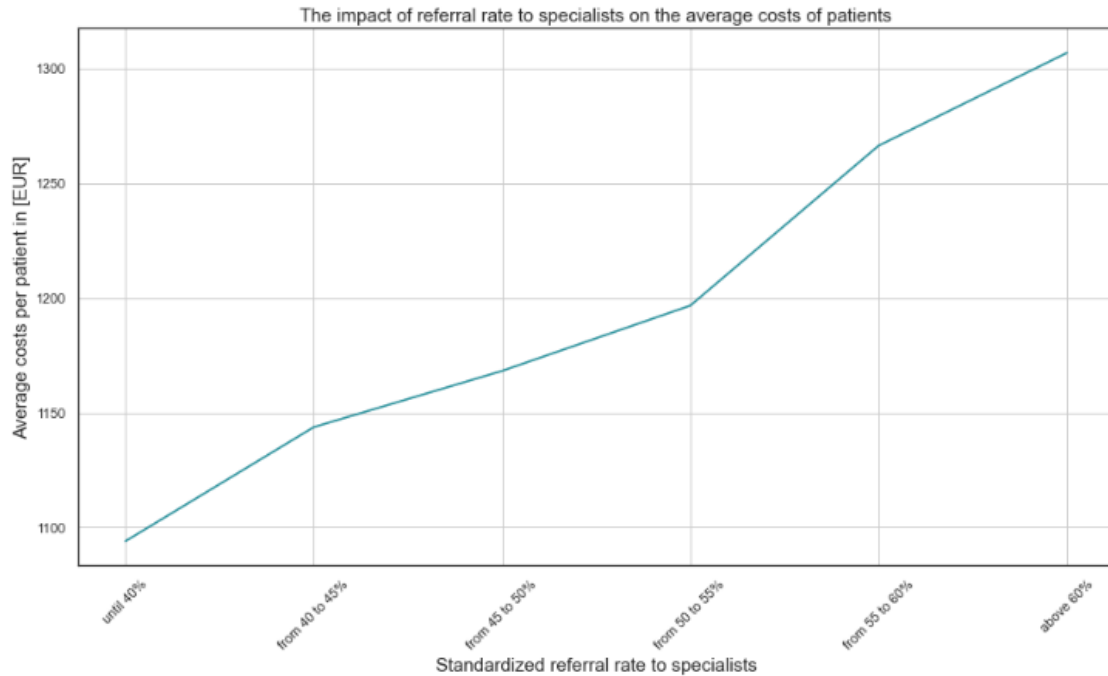


Fig. 5 – The impact of referral rate to specialists on the average costs by patients. Source: own research

Explanatory analysis of the average age of GPs in Fig. 6 shows that younger GPs are located in the east of Slovakia and older GPs in the west of Slovakia.

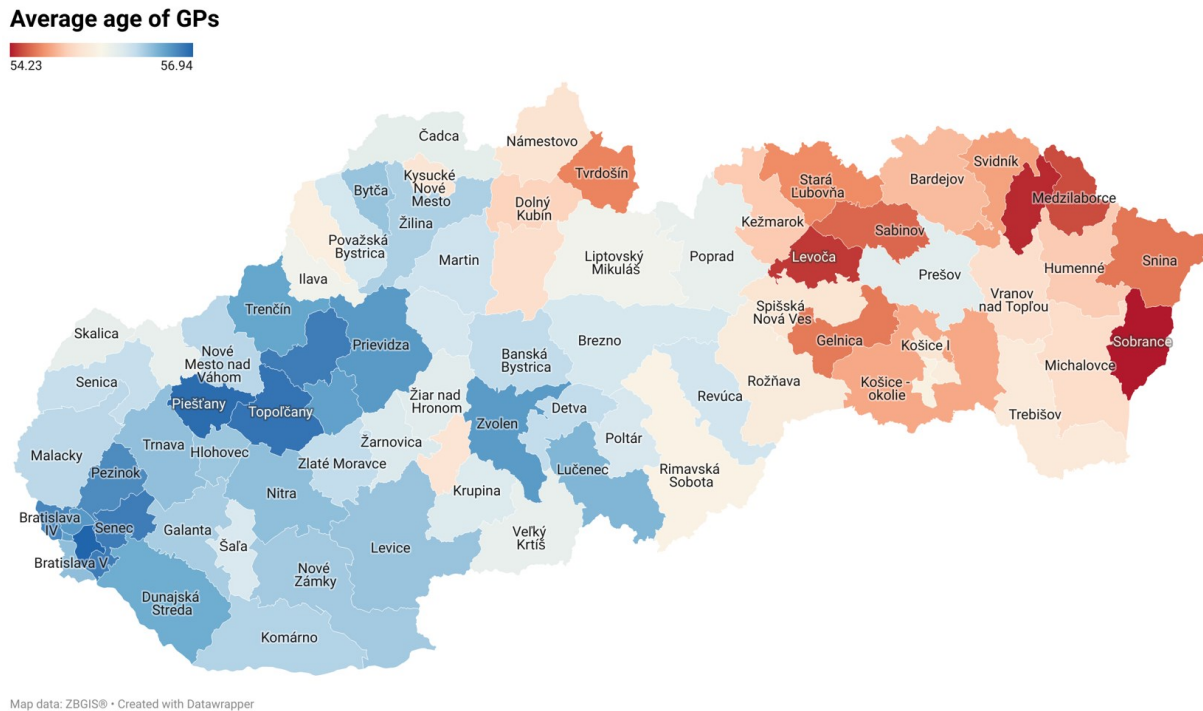


Fig. 6 – Geographical distribution of average GPs age. Source: own research

Fig. 7 illustrates the geographical distribution according to the districts of Slovakia of the average strain difficulty of patients. The higher values are seen in the east districts and lower in the west districts.

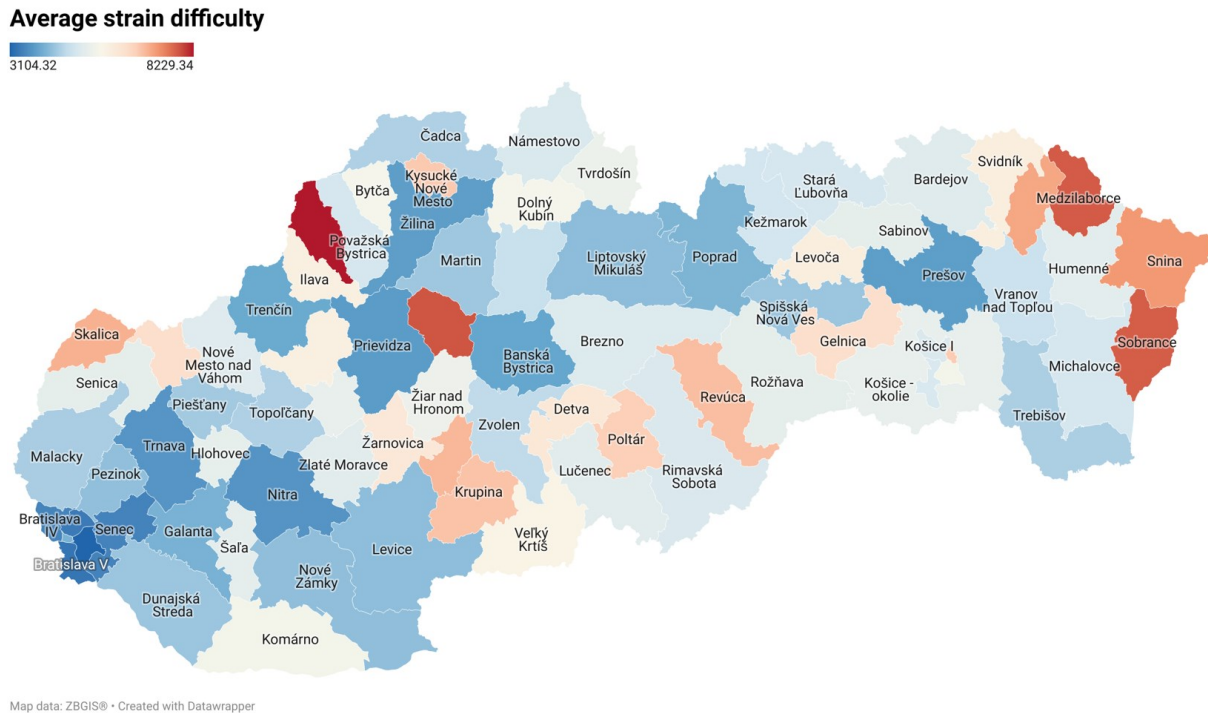


Fig. 7 – Geographical distribution of average strain difficulty of patients. Source: own research

Fig. 6 shows correlations between standardized referral rates and covariates. The correlation matrix between variables is shown in Table 1. We can see that covariates are independent and the diagonal represents the histogram of each variable.

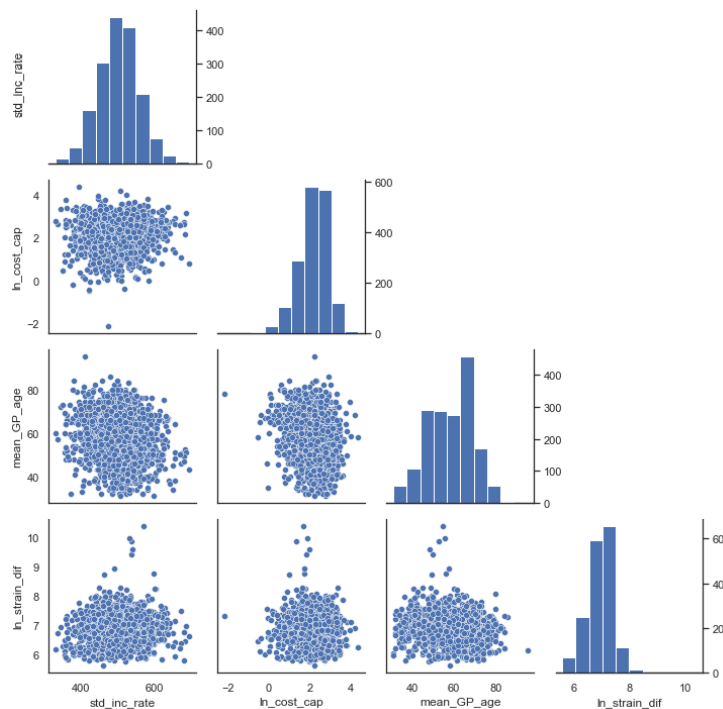


Fig. 8 – Pair plot of correlations between variables and their distributions. Source: own research

Tab. 1 – Correlation matrix of variables. Source: own research

	std_inc_rate	ln_cost_cap	mean_GP_age	ln_strain_dif
std_inc_rate	1	0.074894	-0.140543	0.077606
ln_cost_cap	0.074894	1	-0.197900	0.005156
mean_GP_age	-0.140543	-0.197900	1	-0.144726
ln_strain_dif	0.077606	0.005156	-0.144726	1

After assigning the incidence of referring general practitioners to specialists, we will see which variable can influence this referral and whether it is significant. The regression results are shown in Tab. 2. All coefficients and model are statistically significant. The positive regression coefficients of variables costs above capitation and the severity of the strain mean that referral to specialist increases with a positive change in these variables. The negative regression coefficient of the variable average age of GP means that referral to specialists decreases as the average age of GP increases.

Tab. 2 – Standardized referring to specialist regression. Source: own research

OLS Regression Results	
Variable name	Estimate and statistics
Intercept	482.52(23.26)***
Logarithm of costs above capitation	3.98(1.93)**
Average age of a GP	-0.65 (0.13)***
Logarithm of strain difficulty	7.09 (2.88)**

Standard errors in parentheses. Models include calendar time dummies. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .

No. Observations: 1701, Adj. R-squared: 0.024, AIC: 1.848e+04, BIC: 1.851e+04, Durbin-Watson: 1.84

## 5 DISCUSSION

We tested the primary hypothesis by explanatory analysis in Fig. 5, where we see an evident trend in increasing healthcare costs with a higher standardized referral rate. There is a significant number of GPs whose referral rate to specialists is over the median referral rate, which suggests that they are not performing the gatekeeping role very well. This underlines that higher referral rates drive up healthcare costs.

From the geographical distribution of standardized referral rates from Fig. 3, the higher rate of referrals to specialists in eastern Slovakia compared to western Slovakia is evident, and at the same time, Fig. 6 and Fig. 7 show a lower average age of GPs and a higher average strain difficulty in the east of Slovakia. Based on this explanatory analysis, we can assume that the younger generation of doctors and the higher strain difficulty of patients lead to a higher standardized referral rate.

The secondary hypothesis was tested by this linear regression and it was confirmed that the lower average age of GPs, higher strain difficulty, and higher costs above capitation significantly increase the referral rate. Similar results of the effect of the lower age of GPs were reported in (Bachman & Freeborn, 1982; Wilson et al., 2001, Franks et al., 1999) and the effect of higher strain difficulty was demonstrated in (Forrest et al., 2002; Chan & Austin, 2003; Roland et al., 1990). The effect of the lower average age of GPs on the growth of the referral rate can be explained by the fact that younger GPs have less experience with patients when determining diagnoses and thus prefer more frequent referrals to specialists. The effect of higher patient strain difficulty on referral rate growth is naturally expected.

Our study has limitations, as do other studies using empirical data. First, the use of data from only one health insurance company, which covers 60% of the market. Second is the lack of control variables in linear regression. From the GP's point of view, to catch an effect, the GP

has an ambulance in a hospital, polyclinic, or outside other specialties. From the patient's point of view to have information about the economic status of patients.

Future research should also explore perspectives of potential savings for the healthcare system in Slovakia, which means we need to calculate potential savings. Find a tool that will motivate GPs to gatekeeping and thereby produce savings in the system.

## 6 CONCLUSION

In this study, we look at the role of the general practitioner as a gatekeeper. When making a decision, the GP takes into account all categories of health problems, taking into account socio-economic factors, and the environment in which a person lives and works. Age of GP, strain difficulty of patients, and costs above capitation are significantly associated with referral rates to specialists. Higher referral rates to specialists have a positive impact on average costs per patient. Our study offers insight into the allocations of healthcare resources and how to better design the role of the general practitioner in the healthcare system. These results provide a useful benchmark for GPs, insurance companies, and policymakers in Slovakia.

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# THE POSITION OF DIGITAL MARKETING IN THE STRATEGIC MANAGEMENT PROCESS

*Dana Matoušková*

## **Abstract**

The evolution of internet and web-based technologies are the key factors responsible for the alterations in the corporate ecosystem in the last few years. Business interior structure and management have grown to a digital sphere obsessed with electronic commerce models and digital marketing (DM) tactics. This review study is illustrated the importance of various kinds of digital marketing in developing the firm strategic plan, the magnitudes of the COVID-19 plague in online marketing, management, and their interactions with strategic processes. The findings revealed that many advertisement tactics are used around the world today, each with its content, major objectives, benefits and drawbacks. It is also summarized that DM can provide the best and most refine results for new product marketing to targeted customers, as well as a higher return on investment through value targeting, offers, and intensity.

***Keywords:** Digital marketing, Internet marketing, Marketing strategies, Pandemic, Strategic process, Website.*

***Abbreviations:** Digital Marketing (DM); Return on Investment (ROI); Search Engine Optimization (SEO); Key Performance Indicators (KPIs); Search Engine Marketing (SEM); Social Media (SM); Strategic Management Process (SMP).*

## **1 INTRODUCTION**

The ambition for economic success has resulted in greater competitiveness in the corporate environment, both worldwide and local. To succeed in tumultuous circumstances, organizations must know about their opponents, antagonistic movements conducted over stuff, premeditated developments, and antagonistic gesture (Obonyo and Kilika, 2020; Ojha et al., 2020). Strategic management entails the continuous planning, surveillance, assessment, and appraisal of all requirements that a business must meet to meet its aims and objectives (Hunger, 2020). It is an industry's continuous assessment culture that allows it to surpass its competitors. This process has several steps that include defining the organization's overarching vision for the present and prospective goals. Companies will require to reassess their performance tactics frequently as the business climate is constantly changing (Taouab and Issor, 2019). Traditional marketing techniques are not delivering desired results, and they are unable to target the client, owing to the rapid technological improvements and simultaneous information technology development (Pencarelli, 2020; Ferrell et al., 2021). Furthermore, they are unable to contact important clients due to the marketing problems of adopting a low-cost strategy with fewer human resources.

Digital marketing is one of the most essential and advanced kinds of service campaign or product promotion via the internet, smartphones, and tablets through many techniques at a cheap cost (Kumar and Mittal, 2020; Goyal et al., 2021). This type of marketing entails a review of specific objectives that can be met through internet platforms. A well-executed web-based marketing strategy can be vital to business growth in an environment where several individuals perform businesses on their phones. Internet advertising, along with predictive analytics, has taken centre stage in strategic management and product development. The fast advancement of digital technology has resulted in significant changes in global strategy and operations management (Vargo et al., 2021). Virtual marketing has been labelled as the advanced scrap to

endure the risk of digital distraction (Warner and Wäger, 2019). Web-based marketing is an important component of the SMP, as it helps the company to achieve its aim of seizing and developing new and distinct chances for the future, as well as improving its market position in its ecosystem (Drobyazko et al., 2019). In this twenty-first century, when the corporeal business world has succumbed due to pandemics, the solution is to strategize the process with the use of IT and digital communication (Vargo et al., 2019). This COVID-19 summons the working models, contingency planning, and forecasts to the point that each company's strategy has been revised to accommodate for pandemics. According to studies, the Pandemic had already created major dislocation in the business world, as well as a disturbance in the continual culture of assessment that a company undertakes to outperform its competitors (Dwivedi et al., 2020; Milne and Costa, 2021). A certain number of individuals also believed that COVID-19 had irrevocably changed the way start-ups are managed (McCausland, 2020). The COVID-19 outbreak sparked changes, such as increasing digital networking and marketing initiatives (Habes et al., 2020). In other words, the extent of internet advertising will expand, and businesses will confront new obstacles. Customers' priorities are changing, and the methods needed to start a business and operate it will change as well. The influence of these elements on online marketing will likewise modify the approach.

Considering the lack of literature on the link between online promotion and strategic management mechanisms, the consequences of the COVID-19 plague online marketing, management, and their interactions with strategic processes. The present study aimed to summarize the importance of various kinds of online marketing in developing a strategic plan for a firm. Furthermore, the review fills a gap in the literature and points the way for future study in this field. Marketers and non-technical academics will be able to better comprehend from these findings how the internet marketing environment works in risk management.

## **2 METHODOLOGY**

The research is exploratory; it focuses on literature reviews, newspapers, journals, and the personal experiences of the author.

### **2.1 Literature search strategy**

The review was conducted as per the standard reporting requirements for literature review. Research, review articles and reports online databanks like Google Scholar Archive, Medline, Web of Science, and PubMed, were utilized for searching randomized trials using predefined literature published before April 25th, 2022. Additionally, for identifying the working mechanism, key pillars, and tasks of online marketing the e-sites of various internet-based advertising organizations have been used. The search took place between 23 March to 25 April 2022. Furthermore, the citations of the selected articles were also searched to see if any other publications might be relevant to the research. The findings of the results were filtered using their titles and abstracts. Duplicate articles were removed. The following keywords were used:

1. Strategic management concepts, the position and process of strategic management in the 21st century, and challenges.
2. The influence of the pandemic on management, online advertisement during the global crisis, digital marketing, and its connections, stages in management, implementation of online advertising, integrated approaches to e-marketing, and marketing goals.
3. Tools in digital marketing, gaps, challenges, factors influencing digital marketing/Internet-based marketing/ online marketing/ digital entrepreneurship, traditional advertisement.

In this review, specific inclusion and exclusion criteria were established for all the searched articles. Articles that conceded the criteria were included in the study. Like reports or articles published in a language other than English were not included: since translating these manuscripts will be unfeasible. Non-English-language articles/reports were removed, since translating the papers proved unfeasible. Owing to the difficulty in examining such documents, no dissertations, communications, or unreported findings were included. Studies with ambiguous pertinent data were also ruled out.

## **2.2 Data abstraction**

If the earlier-mentioned principles or criteria were applied to each article, then the resulting information was extracted from each research. After the method for locating and choosing articles was done, the research modelling information extraction was performed. The articles are examined to get the records required to address the research survey interrogations. As a result, the articles having full-text were fetched. The final assessment of the studies was determined after examining the articles and double-checking their bibliographies.

## **3 RESULTS**

Internet marketing is emerging as a dominant paradigm that should be accepted as a key pillar in securing a company's long-term viability and strategic outreaching success. DM includes a variety of channels such as social media, E-mail, content, and website marketing. Executives argued that using the internet as a distribution channel for advertising would boost sales, boost the performance of the organization, and make it easier to meet the company's objectives. A DM strategy is a collection of processes that use the correct marketing tools and methods to help the business community to reach their business objectives. The following elements are included in a digital marketing strategy that is based on goals (Saarinen, 2004): (i) Recognizing the present condition and the issue that is going to prevent the objectives from accomplishing; The primary scheme of addressing the challenges that outline; A list of essential movements that are required to accomplish the goals. SMP and philosophies are requisite to adjust to challenges not ever observed in civilization in the progressing international economy. Strategic management must consider into description as a range of features and anxieties in an ever-changing and context-dependent approach. Enterprises have always dealt with management issues, but things are altering in the twenty-first century, and so are the obstacles that organizations must overcome to ensure their future success. As the digital age and globalization have developed, the approaches and strategies necessary for successful outcomes have gotten increasingly complex, smart, and even innovative. The twenty-first century was predicted to bring considerable changes in management approaches and progressions, owing mostly to the rapid growth of online marketing. The reforms were expected to create a lot of volatility and uncertainty in the environment in which businesses had to function and compete. A survey reported that 49 % of organizations have no defined strategy, followed by 34 % of businesses having mixed digital strategies, while only 17 % of the organization had a defined and clear digital strategy (Figure 1).

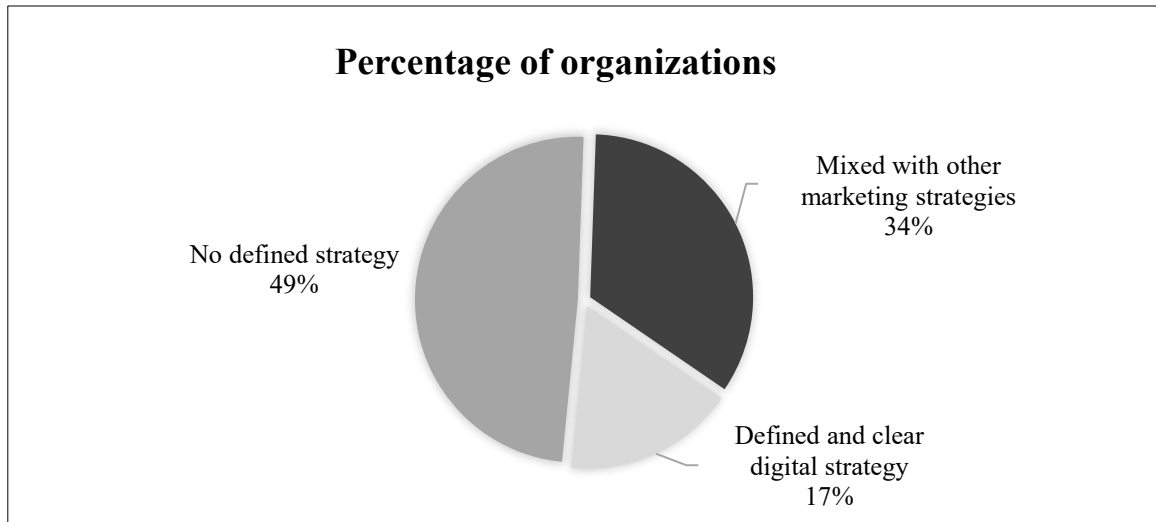


Fig. 1 - Organizations have Digital strategies for their services and products. Source: Smart Insight, 2022

### 3.1 Digital Marketing Systems, Trends, and Framework

With advancements in technology, digital marketing has emerged as a new concept and advertising strategy. Nowadays, numerous advertising tactics are used all over the world, each with its content, major objectives, benefits, and drawbacks. (Table 1).

Tab. 1 - Various types of typical marketing techniques along with their characteristics. Source: Own research based on the sources listed in the last column

Marketing Type	Content	Main Purpose	Pros	Cons	Targeted Audience	Reference
Website	Photos, links, information, and content,	To attract qualified leads and allow them to submit their information	Unlimited information, time-saving	Risk privacy, browser issues	Educated and Professionals	Verma et al. (2020)
Search Engine Optimization	Photos, links, content, and trends	To get higher rankings on search engines which in turn creates a larger target audience	Good website speed, and provide an edge in the competition	Time-consuming, Bigger investment needed	Professionals and experts	Sharma et al. (2019)
E-mail marketing	Writing content and photos	To make the customers on your email list aware of new products, discounts, and other services	Cost-effective, and track user management	Spreading viruses, Battling filters	Educated and uneducated	Jeshurun et al. (2018)
Content	Writing content, articles, and news	To create a piece of advertising that customers want	High level of user engagement, and global reach	Most expensive, Require a content specialist	Educated	Beard et al. (2021)
Social media	Photos, videos, webinars, and explainers	To increase their target audience, generating leads through more traffic	Increase brand visibility, make communication easier	Time-consuming, constant changes	Uneducated, educated, and special groups	Chatterjee and Kar, 2020

Electronic Billboards	Images, and short attractive texts	To enable brands to make relevant information available in one place	Increase sales, and the Click exposure	Geographic problems, and Message limits	Uneducated and educated	Krishen et al. 2021
Mobile marketing	Short messages	To reach a target audience	Instant results, and lower cost	Deletion of messages, Navigation issues	Uneducated and educated	Ittaquallah et al. (2020)
Radio and T.V advertisement	Videos, entertainment, and voice messages	Mostly focuses on new products and programs	Reach potential	Audience fragmentation	Mainly uneducated people and children	Ittaquallah et al. (2020)

Figure 2 stated that taxes, recession, and income levels are the crucial economic factors affecting the position of DM in development, implementation and monitoring developments. According to an annual report of Software Testing Help Company, the website is the most commonly used promotion site having an effectiveness index percentage ranging between 75 % (Figure 3). Through website images, information and articles were shared with educated individuals. Despite the time saving and unlimited information benefit, this have also some cons in the forms of risk privacy and browsing issues. Next, highest (68 %) was experienced by social media, which is almost half greater than that of E-mail marketing. It provides an insight to clients and owners to communicate easily and increase brand visibility. But on the other hand, it requires constant amendments people believe it is a time-consuming process.



Fig. 2 - Main attributes affecting strategic management Digital Marketing processes. Source: Software Testing Help, 2022

While E-mail marketing is also cost-effective and a person can share writings, and subscription policies through it, it has still some cons in the form of spreading viruses and battling filters (Table 1). Electronic mail is a comparatively new method of marketing that almost every company today is using in one or another way. After that, the content marketing effectiveness is 48 %, whose primary aim is to involve, fascinate and recall the spectators by crafting and allocating appropriate reports, webinars, video clips, and other mass media. However, the benefits are not immediate, content marketing can be a long process and require content

specialists. They normally go over a phase of observation and experimentation before getting their desired results to determine what is best suited. While SEO contributes the least 35 % to the organization's strategic outreaching process (Figure 3). It's an important marketing strategy for driving an organic, un-paid rush to their website by employing high-quality content to rank at the high of a search results page. Its primary target audience is workers, literate and illiterate sectors, to achieve greater search engine ranks and hence a larger intended audience. (Table 1).

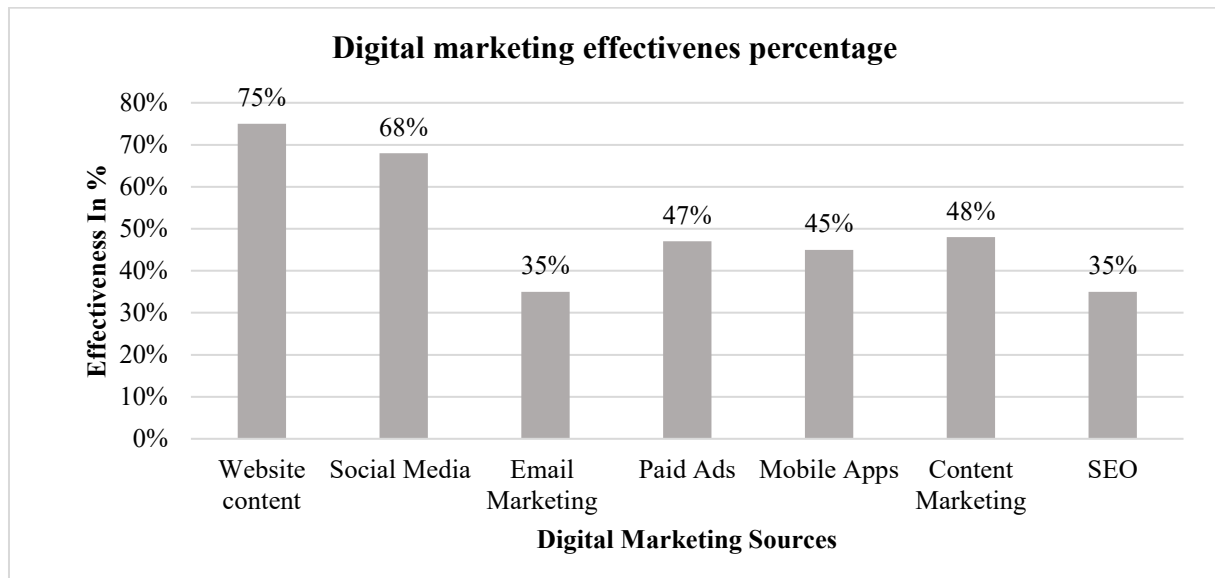


Fig. 3 - List of most operative digital marketing sites for strategic management mechanisms. Source: Software Testing Help, 2022

### 3.2 Digital Marketing in the Age of COVID-19

An outbreak broke out in the world at a time when conventional business tactics were at their peak. At this time, DM comes into play to help consumers comply with the government's urge to limit their outings and spend more time hours at home online. Online billboards, social media, search engine marketing (SEM), SEO, and content marketing are some of the most sophisticated and efficient digital marketing methods. In the long run, new internet services are developed to deal with epidemics. Digital tools, particularly SM tools, have risen to prominence in the era of DM to the throne, taking crucial roles in the communication activities of many brands. During this period, social platforms are seen as successful public communication channels, as an increasing number of people access information through them. After gradually becoming accustomed to internet buying during their home confinement, online content traffic has continued to rise in recent years, giving an incentive for online media to prosper following COVID-19.

### 3.3 Digital Marketing in Strategic Management Process

Internet marketing turns to an inevitable style for clients in day-to-day business. Marketing-required businesses are proliferating these days. When consumers instigate to alter their behaviors to virtual utilization as a consequence of advanced technology 4.0, businesses must have several strategies in place to retort appropriately. The DM business has been able to meet practically all of a company's needs. It arose and grew swiftly as a result of its low cost, ability to reach the right potential clients, and good customer interaction. It offers a novel option that



may be viewed as a "powerful arm" for many enterprises, allowing them to reach a huge number of people and so increase sales. As a result, internet advertisement plays a central role in the growth of business strategic management procedures. Recognizing the potential and importance of digital marketing in today's world, the review's goal was to determine the importance of web-based marketing in business strategies. Managers may use the best DM to create a set of tactics for their company that will help them reach better results. Nowadays, web-based advertising plays a critical part in the formation, growth, and success of businesses (Figure 4). An industry or business in which an organization operates appraises its opponents, identify the objectives to achieve all the present contestants, and then again evaluates each strategy. Several elements such as internet banking, illegal access, unique or inadequate content, and user-friendly design might have an impact on the market's strategic management competitiveness (Figure 2).

However, by implementing digital tactics (social media, E-mail, content and website) through campaigns, blogging and E-web an organization can easily not only formulate their strategy, but also evaluate it through online monitoring, reporting, and Key performance indicators (KPIs) (Figure 4). This evaluation and feedback mechanism can help them to regulate the business environment, needs, and reaction to any substantial change (Figure 2). The adoption of a successful web-based marketing plan is vital to the business's success. This allows an entrepreneur to quickly identify whether the plan is progressing toward the company's goals or not and if it is not, take remedial action. If those actions fail, go through the strategic management process again. It is summarized that DM can provide the best and most refine results for new product marketing to targeted customers, as well as a higher return on investment (ROI) through value targeting, offers, intensity, and sending messages services provided to customers through e-marketing approaches.

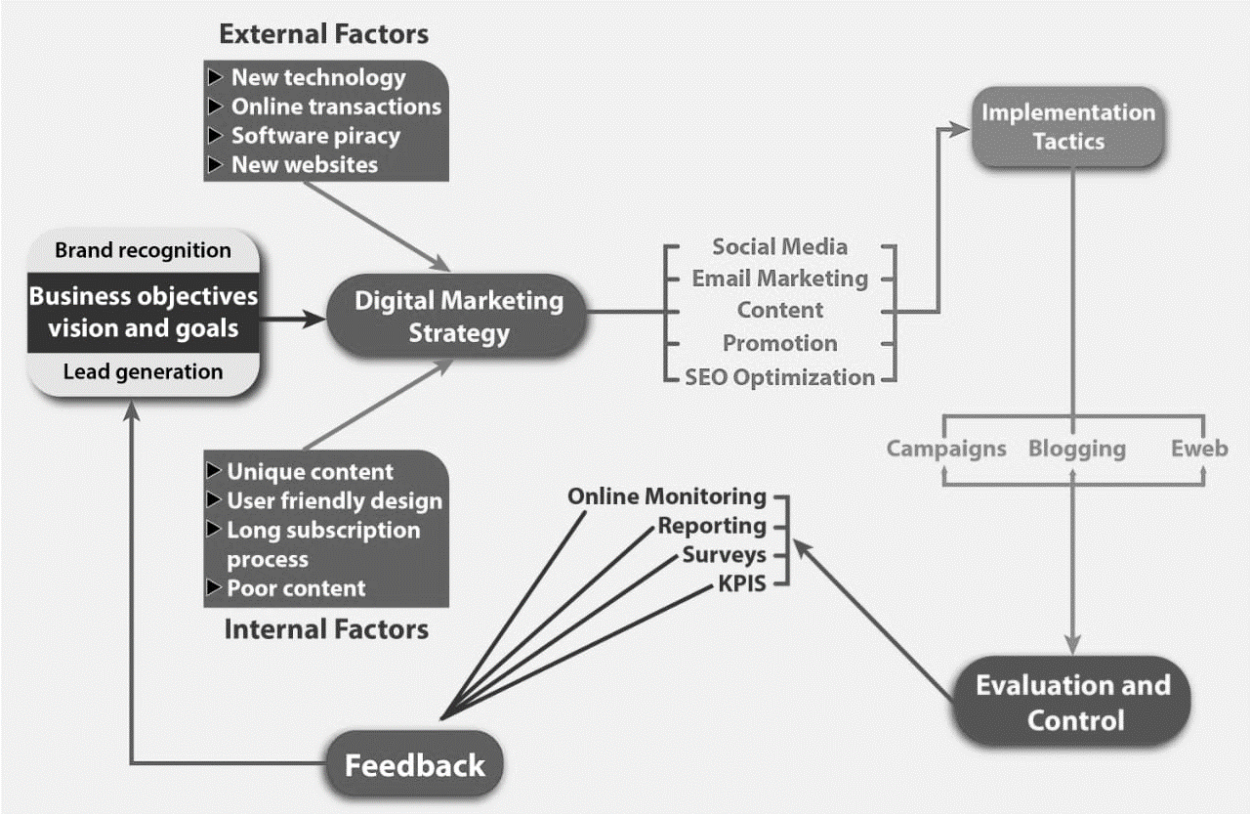


Fig. 4 - Various thematic stages of the strategic management process in the context of digital marketing. Source: own research

## 4 DISCUSSION

The current study examines the crucial position of DM in the strategic management process. It was evident that internet marketing is a form of management scheme which facilitates the strategic outreaching activity of a firm. That is the creation of the best successful concepts necessary for the execution of goods for their company that will have a favourable influence not only on revenue but also on brand promotion. Fedoryshyna et al. (2021) reported the same that digital technology has touched new statures, and several people are spending time online for cracking their issues. The study by Anumolu et al. (2015) disclosed the web-based marketing bond with the strategic management steps, the same as the document in the current study. The reason is its lower cost (Olson et al. (2021), global reach (Ananth and Dananjayan, 2019), multiple strategies (Anderson and Manis, 2022) and effective targeting (Veleva and Tsvetanova, 2020). Figure 2 illustrated the most effective web-based marketing platforms results, which were in line with the studies of Daries et al. (2020); Verma et al. (2020), who also recapitulated that website is the most applied marketing platform for the creation of strategy and performance depths.

The high efficiency is due to its tailored promotion approach and levelling of specific verticals (Frederiksen, 2021). Similarly, due to its long strategic process, and no guaranteed results the SEO was also reported as a spurn way in a study performed by Lewandowski and Schultheiß, (2022). Lewandowski and Schultheiß (2022) also reported that only 8.9 % of users know this way of marketing. The COVID-19 resulted in considerable improvements, particularly in marketing, which led to increased digital usage. Quesenberry et al. (2020) summarized that almost half of the earth's inhabitants are now habitual with the social media for commerce and management, and the number continues to rise. According to the Global Web Index report people are using almost nine different digital platforms for gathering, scrutinizing and providing data for strategic drives (Global Web Index, 2022). These studies and findings serve as pillars for demonstrating the importance of digital advertising services in examining the internal and external elements that influence a business and determining the best course of action for achieving milestones during and after COVID-19.

Furthermore, studies also documented that the way of marketing may vary from business to business and depends on the type of industry, customers, location of business, products and service types. Rabby et al. 2022 documented that DM gives more information about businesses and it is currently experiencing evolution in digitalization and marketing technology. Web-based advertising has given marketers fresh ways to reach out to targeted consumers. Christina et al. 2022 stated that E-mail is widely viewed as an effective internet marketing tool. Figure 2 takes into account the unique characteristics of the strategic management plan, as well as the traditional aspects of the marketing complex. An effective strategic tangible plan that includes all of the digital sites required for a systematic examination of an organization's internal and external environments, resulting in the establishment of a decisive and intentional path of action (Melović et al., 2020). Based on the literature, results, and graphical representation, the critical position of digital marketing in defining objectives, studying the challenging market, analysing the internal structure, evaluating tactics, and assuring that management implements the strategies. A solid digital marketing plan can benefit any prospective organization because it gives firms a greater chance to sustain, compete, and develop.

The current study is limited to full fill the gaps with literature and accurate results in online promotion and strategic management mechanisms, the consequences of the COVID-19 plague on online marketing, management, and their interactions with strategic processes. Furthermore,

to identify the importance of various kinds of digital marketing in developing a strategic plan for a firm. All the literature and results were gathered up to 25 April 2022.

## 5 CONCLUSION

Internet marketing is emerging as a dominant paradigm that should be accepted as a key pillar in securing a company's long-term viability and strategic outreaching success. The key characteristics of the consumption of online marketing toolkits in strategic regulating mechanisms in each field are examined in this study. The primary adaptation strategies, platforms, and feedback regulation are all connected to the notion of online advertising, and each of them is utilized to accomplish distinct aims, which may be selected during strategy formulation. The initial years of the 21st century already brought significant changes in the management techniques and progressions, primarily to the rapid development of increasing internet marketing. The performance of web-based marketing tools is advised to be measured using KPIs following the chosen aims. The website is the most commonly used promotion site having an effectiveness index of 75 %. It is clear from the discussion that digital Strategic management extends to inner and outer practices as well as to track, which ensures that the firm meets goals as defined in its strategic management plan. Finally, the study concludes that DM can give good and reliable outcomes for precise client targeting and to get the besieged goals and objectives.

The review is an effort made to identify the key position of digital marketing in the main steps strategic management process. However, further research is needed to identify and overcome the challenges that affect the online promotion strategies in the business development. Moreover, the current review provides an insight that each business has different marketing strategy which depends on the type of business and their clients, so additional research on this side will explore more the opportunities. A gap is still left in the identification of key performance indicators which determine the efficiency of digital marketing in companies strategic, financial, and operational achievements.

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# LABOR ECONOMIC ASPECT OF AN AUTOMATION: A PROPOSED STUDY USING ADVANCED MACHINE LEARNING ALGORITHMS

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## Abstract

This proposed research study aims to examine the effect of automation and robotization on the employment situation in Europe. The study will evaluate and analyze by identifying the risk of substitution of job classification along with a proposed empirical analysis by using advanced technologies such as machine learning (ML), robotics, and automated processing units. The study will employ the advanced methodology of modeling and prediction to evaluate the risk of substitution of the classified jobs by automation while focusing on the task-based structure. The advanced prediction tools, primarily Artificial Intelligence (AI) and Machine Learning (ML), will contribute to the evaluation of the latent relationship between automation and the tasks performed by jobs. This research study will contribute to scientific works by providing significant results for understanding the true effects of automation on classified jobs, particularly in manufacturing sectors.

*Keywords: Automation, Employment, ML Algorithms, Labor economics*

## 1 INTRODUCTION

Diversification of production value chains has made mass consumption of commodities cheaper, quicker, and more convenient. With this great demand and rapid development in digitization across regional and global economies, there has been a constant and continuous push for technology adoption in the form of robotics, artificial intelligence, and machine learning. The emergence of these technological tools in favor of high-skilled labor has created both opportunities and challenges for the global youth population. In this regard, there has been an ongoing debate about the significant benefits of automation for the entire economy in terms of increased GDP, higher productivity, and concerns about unemployment, wages, and the distribution of such benefits.

In the European countries, survey and research reports estimate that about 14% of the EU adult workforce market (European Center for Development) and up to 51% of jobs in Europe (Deloitte, 2018) are expected to be affected by automation given the technological possibilities and structure of the economy. This is coupled with a constant rise in productivity, and the economy's potential would increase by 78% by 2033, which is more than double the growth rate without using robotization (Deloitte, 2018).

Given such warning statistics, the purpose of this study is to explore and analyze the link between the automation sector and the labor market. The European economies offer the ideal research laboratory to undertake this study because the continent and region is engaged in preparing the economy for major socio-economic changes, particularly structural ones. Such changes are caused by the development of robotics and artificial intelligence, while designing an appropriate legal and ethical framework for all the related processes. The Ministry of Labor and Social Affairs of the Czech Republic in 2016, highlighted that Industry 4.0 will offer a number of advantages, however its threats, such as the lack of management and structural changes within the labor market, and the social and ethical dimensions of Industry 4.0 implementation, must not be overlooked. Hence, it would be necessary for firms to empower their employees in a preparedness manner into such changes that accompany Industry 4.0.

Extensive use of robotics, automation and digitization will have serious implications for skills, jobs, and occupations as it will be accompanied by a change in tasks and requirements for people in the firm (Gorecky et. al., 2014; Sumer, 2018).

This proposed study will research while reviewing the current issues relating to the effect of automation and the possibility that automation and robots will replace human labor. Subsequently, the study will be conducted while researching in detail the advanced machine learning in the methodological section.

## **2 LITERATURE REVIEW**

In the current state of research studies, there have been two major aspects put forth by the introduction of automation and digitalization in the labor market, namely the substitutability of the labor force by automation (Berg et al., 2018; DeCanio, 2016; Bessen, 2019; Acemoglu and Restrepo, 2019) and the growing inequalities involving labor market polarization and skill upgradation (Calvino and Virgillito, 2018; Ugur et al., 2018; Vivarelli, 2014). These two issues are analyzed based on two prominent theories on the link between technology and the labor market: SBTC (Skilled Biased Technical Change) and its revised version, RBTC (Routine Biased Technical Change). The theories consider the changes in structural task and work activities along with shifts in employment and employed sectors and examine the need for new skills for humans and their ability to compete against the potential replacements to perform jobs which complement those of machines.

The first prominent theory discussed with respect to this topic is called Skill Biased Technical Change, or SBTC, which explains that technology creates demand for skilled labor as they complement each other, whereas unskilled workers are at risk of being substituted by technology. Hence, the theory can be called "skill biased". The theory has been shown to be effective in explaining the impact of technology on the labor market at both the macro and micro levels. Based on this theory, studies show that employment and wages of skilled workers in the US rose during the 1980s along with the advancement of technology. Although SBTC has been successful in explaining how technological change affects employment and wages, it has been criticized for not accounting for employment and wage patterns in the US after the 1990s and the change in employment of median-wage workers.

For these reasons, a revised version of the SBTC model called RBTC has been proposed to examine the interaction among worker skills, job tasks, evolving technologies, and shifting trading opportunities that have shaped the recent changes in the earnings and employment distribution in the United States and other advanced economies. Empirical evidence shows that RBTC is successful in explaining how cheaper computerization progressively replaced human labor in routine tasks, leading to an increase in the relative demand for non-routine ones. Acemo and Auto (2010) propose a tractable task-based model in which the assignment of skills to tasks is endogenous and technical change may involve the substitution of machines for certain tasks previously performed by labor. Acemoglu & Autor (2011) suggest that the types of jobs that are more likely to be affected by automation are those that have more manual tasks associated with their job description. The study considers the skills, tasks, and technology implications for employment and earnings. The study also suggests that technology and automation have less effect on some fields and more on others, such as social and caring services, which are not much affected by automation, compared to jobs that require manual strength tasks. Current research on automation is invested in manual types of jobs, such as driving, much more than high-skill jobs such as dentistry, healthcare, etc. This can also suggest that jobs which are mostly considered on the basis of gender demographics are more at risk than jobs considered as their counterparts in gender. The future jobless society might have a severe impact more on the basis



of demographics. Moreover, humans with fewer skills are also more at risk. Some expertise, such as accounting, would still be affected more than some other fields of high-skilled jobs. Nikolaos & Raquel (2021) demonstrate that employment growth is more likely to polarize in less densely populated regions and those with higher initial specialization in medium-and high-skilled sectors. Despite being a nuanced version, it is suggested that RTCT is not immune to challenges from a conceptual, operational, and empirical point of view (Fernández-Macías and Hurley 2016; Sebastian 2018). Sebastian (2018) suggests focusing on the development of a measurement framework that addresses the challenges raised in this report.

Tab. 1 – Description of research studies field. Source: Own research

Area of Research/Reference	1	2	3	4
Berg et al., 2018; DeCanio, 2016; Bessen, 2019; Acemoglu and Restrepo, 2019	•			
Acemoglu and Restrepo, 2017; Brynjolfsson and McAfee, 2014; Frey and Osborne, 2017; Kenney and Zysman, 2019		•		
Acemoglu and Autor, 2011; Sebastian and Biagi, 2018			•	
Calvino and Virgillito, 2018; Ugur et al., 2018; Vivarelli, 2014				•

1. Substitutability of human labor by robots and machines    2. Time horizon of technological change  
 3. Changes in task structure    4. Job polarization and upskilling of labor

### 3 METHODOLOGY

The proposed study intends to perform the processing of secondary data to analyze and describe how automation will impact jobs using artificial intelligence (AI). AI machine learning will be utilized in this proposed study utilizing data analytics and artificial neural networks. The computation will be done by first training the system and subsequently validating the trained system. After the training, the system is supplied with a new dataset, with a known state, to validate that the training is successful. To validate the system, it will be provided with sample data to test its efficiency. In case the system is well trained, the validation data will label the data correctly. The label will be known before the test as the sample data has a known label, though the label will not be given to the system. The system functions properly if its label matches the sample data label. The areas of focus for the skill set are as illustrated in Fig. 1.

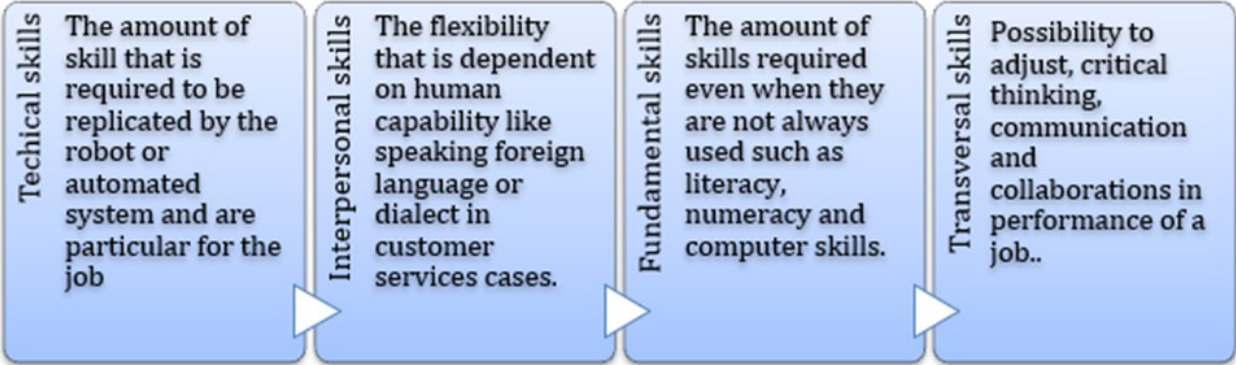


Fig. 1: Area of focus on skill set (Source: Project proposer/PWC report, 2018)

### 3.1 Data collection, sampling and analysis

The data will be collected from several data samples of the International Labor Organization and databases as listed in Fig. 7. These data sets represent various parameters, each representing a specific data point linking automation and its effect on employment. The proposed study will be reviewing and researching these datasets based on literature review and expected future results to create a general pattern and model for interpreting this data. The authors will analyze and review research data from the economies of Europe and other parts of the world while focusing on creating a model of employment and automation. The tasks include researching, reviewing, and data collection along with computation on those parameters to create a view model of the effect of automation on employment. Advanced machine learning algorithms will be applied. The collected sample data will be fed into a machine learning algorithm and will be trained and then fed to project models. Research configurations of artificial neural networks will have to be adjusted so that the appropriate aspects are researched. Moreover, categorization and classification will be applied, and those would directly modify our model of ML.

The study will first critically review the Marco, sectoral, firm, and task level associated with the classified jobs, along with insights developed from the discussion and panel analysis with research and industry practitioners. The study is expected to review the results as illustrated in Fig. 2.

Macro Level	Sectoral Level	Firm Level	Task Level	Questionnaire
Robot production counts Robot intensity (Robots per person) Changes in employment shares Change in employment rate	Sectoral level based on secondary data bases in fig.6 Research questionnaire on sectors to be selected for study.	Number of installed robots Change in use of robots/labour input	Classifications of jobs based on sectors and nature of jobs employability	A customized questionnaire will be adapted/created based on above parameters from empirical literature for the insight to data at firm level.

Fig. 2 - Key researched variables. Source: own proposed study

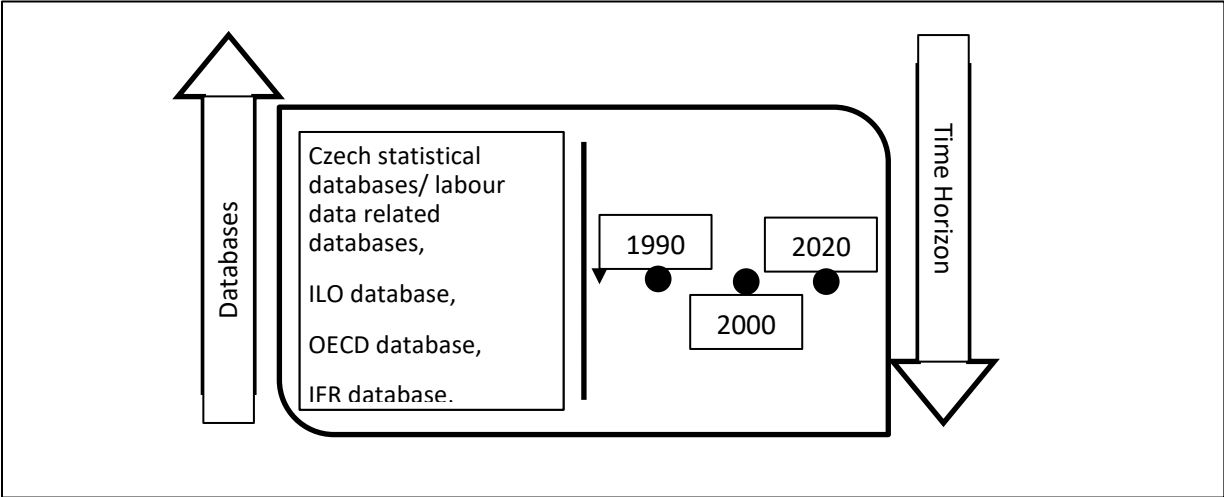


Fig. 3 – Data sources and timeline for study. Source: own proposed study

The proposed research study will collect and gather data on skills and job descriptions that would be analyzed and researched considering tasks-based probability on substitutions. Automation is performed considering the benefits on costs and probability on substitution by

tasks of the job description. A computer system is designed to carry out a task as provided in the job description hence the need of human employees is reduced or eliminated. Few job descriptions are easier to be replaced than others by machines. Hence, the collection of job titles and job description can help indicate the propensity of automobility of a job. Data on job descriptions and other related fields is provided by the international labor organization. Another such description is used by the United States labor office. These two lists from databases as listed in Fig.3 will be customized to analyze and research on the European economies market. The data collected from such sources will be utilized to develop a model and the model. A sample of 100 features and at least 50 thousand data records is expected to be extracted from databases and questionnaires. An algorithm would then be developed to be able to describe three relationships of four factors as detailed in Fig. 4.

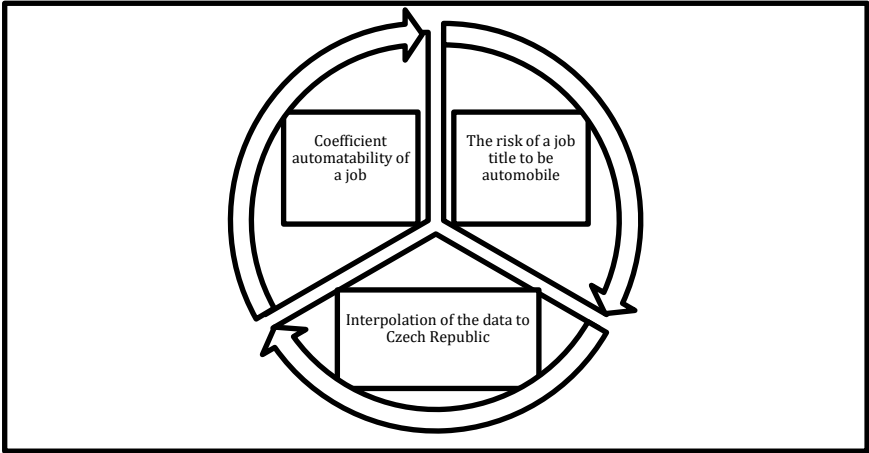


Fig. 4 - Model development factors. Source: own proposed study

Machine learning and artificial intelligence can predict, determine, and interpolate the data based on a model developed on appropriate features. The proposed study shall use a variety of variables Fig. 1 and keys as features in the development of the algorithm. Statistical data would be collected and used to make a model. The data would be for both training and testing. The data would have a high coefficient in the testing as we intend to use the data.

**4 EXPECTED CONTRIBUTION AND APPLICATION OF RESULTS**

The study research study is expected to contribute by providing insight into the current automation situation and the impact of automation on employment for academics, researchers, practitioners and policy makers. This study will analyze the impact of future automation on the labor market by applying occupation-based approaches and task-based approaches. The expected results will contribute to the following fields from the perspective of scientific research and practical aspects.

This study has potential significant benefits at the macro and firm level. The study at the macro level is expected to provide significant results on the widespread concern and belief that automation and computerization/digitalization might result in a jobless society/future by clearly separating and presenting occupation-based jobs (using occupation-based approaches designed by Frey and Osborne, 2016) and task-based jobs (using task-based approaches) that will be automated by technology. Furthermore, the results of this project study will be noteworthy in addressing the ongoing discussion on whether robots should be brought under taxation. In the United States, the proposal to impose a tax on robots was proposed by billionaire Bill Gates, and at the same time, in the EU state of France, by a presidential candidate to partially impose a tax on robots to raise universal basic income. However, the proposal to impose a robot tax in

order to finance those who lose jobs due to AI and robots was rejected by European lawmakers. This project study will present evidence which can be utilized as a basis for policy makers to address and respond to the concerns regarding tax imposition.

Firm level results from this proposed research study is expected to provide important directions on devices and tasks which a firm can define or build to innovative their capacity. This will enable firms to increase their competitiveness in domestic and international markets. This will have a direct and positive impact on their export performance and market share in the long run by adjusting themselves for future computerization in the labor market outcomes.

## 5 CONCLUSION

The proposed study aims to study, review and contribute to the scientific research results of novel quality from the perspective of technology impact in production and economics for the Labor market. The proposed study will contribute to a significant methodological advance (marginal contribution to the international literature) by proposing variations of the standard methodologies to analyze the risks of automation/technology on the labor markets by applying advanced ML algorithms.

The proposed research study is expected to research on the scientific methods while evaluating the tasks as technical skills, interpersonal skills, Fundamental skills, Transversal skills. The expected results will also address the ongoing debate of automation and job loss will be accompanied with interest to deepen knowledge on the related topic and also augmenting and progression on the results of previous research studies. The model developed for the labor market of the economies of Europe can be utilized for identifying real and tangible effects on the ground for the job and task specification.

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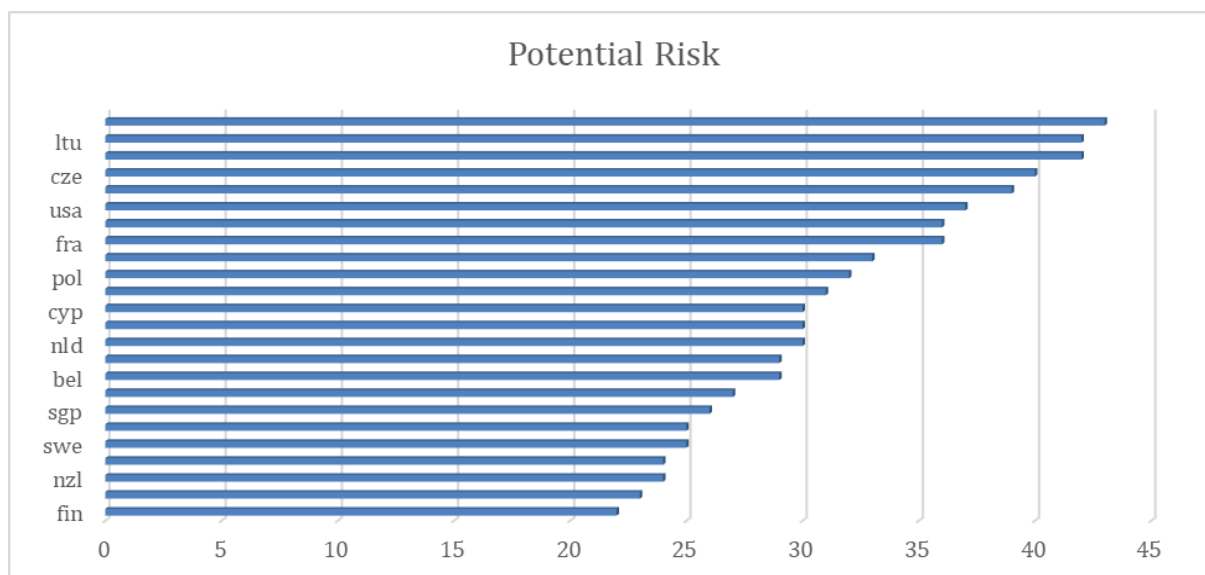
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**Annexure:** Country wise potential risk to jobs. Source: own proposed study & PWC report, 2018



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# WELL-BEING MANAGEMENT: LITERATURE REVIEW ON WELL-BEING-ORIENTED HRM PRACTICES (WBHRM) AND ORGANIZATIONAL CITIZENSHIP BEHAVIOR (OCB) IN THE HEALTHCARE INDUSTRY: THE ROLE OF ETHICAL LEADERSHIP

*Phuong Nguyen, Nga Ha, Tuan Tran*

## Abstract

This study aims to have the general literature review on WBHRM, OCB with the moderating role of ethical leadership and explore the link between them, especially in the healthcare industry. In recent years, the study of well-being-oriented HRM practices (WBHRM) and organizational citizenship behavior (OCB) have been highly focused by organizations and researchers. While most of HRM researches and models are based on organizational performance improvement, WBHRM prioritizes enhancing employee well-being and employment relationship in workplace well-being. On the other hand, OCB is considered as the result of organizational strategies of HRM practices and the development of organizational culture. Finally, both WBHRM and OCB are aimed at both individual and organizational performance. Quantitative research by survey from managers (supervisory, middle and senior levels) in public and private hospitals in Vietnam is used. Hospital senior managers, owners and investors can use this study as a material to develop their WBHRM and OCB strategies. Implications and directions for future research are outlined.

**Keywords:** *well-being-oriented HRM practices (WBHRM), organizational citizenship behavior (OCB), ethical leadership, healthcare, hospital*

## 1 INTRODUCTION

The main objective of this paper is to develop conceptual model for the study on the relationship between WBHRM and extra-role performance, in particular of OCB. During the past years, theories and research on HRM have found the importance of HRM at individual and organizational levels. Specifically, HRM needs to focus on the mutual benefits of individuals and organizations (Guest, 2017). HRM design and implementation should focus on four types of outcomes (affective, cognitive, symbolic and communicative) that influence individual, group and organizational performance (Benschop, 2001).

While most of the traditional HRM practices continuously pursue the improvement of the employment relationship, reward systems, etc, recent studies on HRM pays more attention to employee well-being and its related variable outcomes and factors. For example, according to the study of Cooper, Wang, Bartram, Cooke (2019), the development of resilience and subsequent employee performance is influenced by WBHRM practices through social climate. Therefore, reinforcing WBHRM practices increases the development of resilience and employee performance. However, Salas, Alegre, Lopez (2021) mentioned that there are few studies on HRM and leadership that are related to the employee's well-being and performance.

On the other hand, most of the theories and studies in organizational behavior have been focusing on measurement and analysis at the individual, rather than group level and multi-level. This might be a problem for OCB practices because its theory aims at multiple levels of organization (Schnake, Dumler, 2003). Somech and Drach-Zahavy (2004) has found that organizational learning (structures and values) is positively related to (1) OCB that benefit the organization as a whole (OCBO) and (b) OCB that immediately benefits individuals (OCBI).



Moreover, during the literature review, employee well-being and OCB together have the relationship with ethical leadership, but this relationship has not been studied.

Thus, both WBHRM and OCB not only benefit individuals, but also the organization. They affect individual and organizational performance, well-being, and behaviors. Therefore, finding out the relationship between WBHRM and OCB will be an interesting point for this research and future studies.

## **2 THEORETICAL BACKGROUND/LITERATURE REVIEW**

### **2.1 Well-being-oriented HRM practices**

(Guest 2017) mentioned that changes at the workplace are negatively impacting employees, and the organization. These changes have shifted the HRM research's focus towards employee well-being. Moreover, the understanding of the effect between the relationship of well-being HRM practices and employee's performance is still underdeveloped. In this study, the assumptions of social exchange theory were applied to suggest that high employee well-being and a positive employment relationship will have both direct and indirect effects on performance. In addition, psychology highlights that employee well-being, happiness, and constructive cognitions such as resilience are the route to enhanced employee performance (Seligman, 2002; Youssef & Luthans, 2005). The study by Wood, Van, Croon, De Menezes (2012) found that performance is related to high-involvement work practices, not employee well-being. Guest (2017) suggested that psychological, physical, and social functioning are three key dimensions of well-being. He also designed some HRM practices to help promote employee well-being. Investment in employees (e.g., training and development), engaging work (e.g., job designed to provide autonomy and challenge, information provision), and positive social and physical activities are included in well-being-oriented HRM practices (Guest, 2017).

An intriguing study from Cooper, Wang, Bartram, Cook (2019, p. 85) found that "*well-being-oriented HRM practices increase development of resilience and subsequent employee performance at the workplace, namely through influencing group feelings of social climate*". Another study from Salas, Alegre, Lopez (2021) found that individual performance is stimulated by WBHRM practices through employee well-being. They also suggested that "*WBHRM and engaging leadership enable consistent messages to be sent from both the HR department and direct superiors, based on a motivational process in which job resources lead to positive attitudes and an improved performance. In other words, it takes two to tango, and both HRM practices and leadership need to focus on the employees for a win-win scenario of mutual gains* (Salas, Alegre, Lopez, 2021, p. 344)". Literature review has shown that WBHRM are very important to both the individuals and the organization, and interestingly need to be clarified.

### **2.2 Organizational Citizenship Behavior (OCB)**

Organ (1988, p. 4) defined OCB as "*an individual behavior that is discretionary, not directly or explicitly recognized by the formal reward system, and in the aggregate promotes the effective functioning of the organization. By discretionary, we mean that the behavior is not an enforceable requirement of the role or the job description, that is, the clearly specifiable terms of the person's employment contract with the organization; the behavior is rather a matter of personal choice, so that its omission is not generally understood as punishment.*" There are three significant characteristics drawn from this definition: (1) the behavior has to be voluntary and without any scope of role-described or formal job duties, (2) the behavior benefits the organization from an organizational perspective. It means that OCB does not just aimlessly

happen in the organization but the behaviors are directly and purposely toward the organizational benefits, and (3) multidimensional nature of OCB. About 30 forms of different behaviors grouped into seven categories were introduced by Podsakoff (2000) including: helping behaviors, sportsmanship, organizational loyalty, organizational compliance, individual initiative, civic virtue, and self-development. (Koys, 2001, p. 103) stated that *“employee attitudes cannot influence the organizational efficiency on their own; employees must also behave appropriately. Two factors that are important to many managers are job performance and retention.”* In this study, Koys considered the aspect of performance behavior as organizational citizenship. Based on the social exchange theory from Blau (1964), combining citizenship behaviors would improve the group performance when there is a group collaboration (Organ, 1988; Podsakoff, Ahearne, & MacKensie, 1997). Moreover, OCB leads to customer citizenship behavior (CCB), which is of importance to employees and the organization in today’s service business. CCB is defined as “voluntary and discretionary behaviors that are not required for a successful production or delivery of a service, but, in the aggregate, help the organization overall” (Groth, 2005, p. 11). A study by Chan, Gong, Zhang, Zhou (2017) found that OCB can help promoting CCB through social exchange relationship.

### **2.3 Ethical Leadership**

Ethical leadership is a leadership style that basically illustrates, follows appropriate behaviors, and communicates its importance to the followers (Brown et al., 2005). The two important facets of ethical leadership include: the moral person facet and the moral manager facet (Brown & Treviño, 2006). Moral person facet is related to personal behaviors and the traits of a leader, such as: reliability, fairness and people-orientedness. The moral manager facet is related to leaders’ efforts and actions that used to influence followers’ ethical behaviors, such as communicating ethical standards, role modelling ethical behaviors and punishing those who display unethical behaviors (Mostafa, 2018).

### **2.4 WBHRM – Ethical Leadership – OCB**

Inceoglu et al. (2018) suggests that future researches need to pay attention on the impacts of leadership behaviors to employee well-being, so the applicable results from the researches will have benefits for the relationship between the employee and the organization. Kalshoven & Boon’s study (Kalshoven & Boon, 2012) found that ethical leadership bring and inspires employee well-being in their organization. Moreover, ethical culture promotes employee’s affective experience and employee well-being (Abdelmotalieb, Saha, 2019). Also, past studies have shown that ethical leadership is strongly related to OCB with the suggestions to find more existing moderators in this relationship, and it’s difficult find the moderators for ethical leadership – citizenship behavior relationship (Mostafa, 2018; Kalshoven et al., 2013)

As WBHRM practices, ethical leadership and OCB affect both individuals and organizations. Since the relationship about them have not been focused, recent research on WBHRM motivates to find the relationship between WBHRM, extra-role performance and different leadership styles such as OCB, WBHRM, and ethical leadership (Salas, Alegre, López, 2021).

### **2.5 The Importance of Employee Well-Being in the Healthcare Industry**

Healthcare employees, especially, hospital staff have to face critical challenges related to human life, patient safety, protocol procedures/policies compliance, patient satisfaction under pressure of time, stressors, ethical aspects and job responsibilities. Facing high levels of stress in day-to-day work can cause healthcare professionals (HCPs) mental & emotional disorders, substance abuse and even suicide. Repeated exposure of emotional, mental, physical experiences of distress and unhappiness of HCPs are serious concerns to the hospitals because

they are the reasons of low performance, low patient satisfaction, and high turnover rate of employees. Therefore, employee well-being in terms of WBHRM is considered as new and important conceptual antidote to improve employee well-being, individual and organizational performance nowadays.

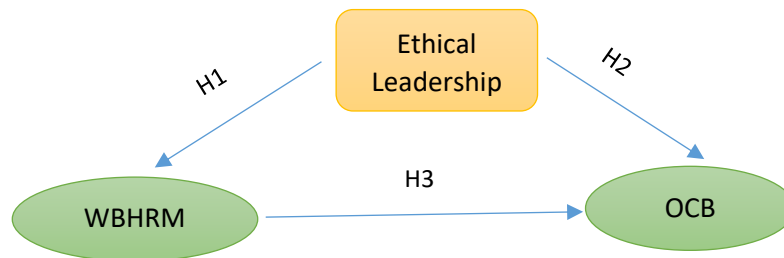


Fig. 1 - Theoretical Model. WBHRM = well-being-oriented HRM, OCB = organizational citizenship behavior.

Source: own research

### 3 METHODOLOGY

The primary goal of this paper is to find the link between WBHRM practices and OCB. Quantitative survey research is applied, and data collection will be conducted through the distribution of highly structured questionnaires to hospital managers at supervisory, leader, middle and senior managers in private and public hospitals with mainly focus in the central and south regions in Vietnam. The study aims to have at least 300 responses from hospital managers for the survey through focus groups, mail-in, and online survey methods.

The questionnaires will be transferred to the selected variables to obtain feedback, which is required for analysis. Only those respondents who complete the questionnaire correctly will be included in the final evaluation of the obtained data. The response will be illustrated through the 5-Point Likert scale, indicating levels of agreement or disagreement.

The tested hypotheses:

*H1: WBHRM is positively related to Ethical leadership*

*H2: Ethical leadership is positively related to OCB*

*H3: WBHRM is positively related to OCB*

### 4 DISCUSSION AND CONCLUSION

Even though the theory and practices of WBHRM and OCB have been existing and practicing for a while in other service/hospitality industries, they are still new to the healthcare industry. Hospital staff in clinical departments have to face critical challenges related to human life, patient safety, protocol procedures/policies under pressure of time, ethical aspects and job responsibilities. Besides, hospital staff has to perform extra-roles which are not in their job description and formal duties to colleagues and patients. For example, a doctor or a nurse has to take an incapable patient upstairs to other the doctor' examination rooms when the customer service employee or security guards are absent. With the literature review of WBHRM practices and OCB we can see WBHRM is positively related OCB. Moreover, WBHRM theoretically promotes OCB in the organization by focusing on employee well-being such as: mental, physical, financial, social well-being, etc. This study is one of the first papers to explore the relationship between WBHRM and OCB or extra-role performance in the healthcare industry with the mediating role of ethical leadership. It provides hospital senior managers and owners

with good understanding about benefits of WBHRM practices, OCB in the healthcare industry, and it also contributes to the research gap of Salas, Alegre, Lopez (2021).

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# CULTURAL ENVIRONMENT AND INNOVATION IN ARAB COUNTRIES

*Emad Attia Mohamed Omran, Michael Amponsah Odei*

## **Abstract**

This exploratory study investigates the effects of the four cultural dimensions introduced by Hofstede (2001) on innovation initiation measured by the number of trademarks per capita covering 12 Arab countries at the regional level. This study adopts document analysis with some scientific articles and a qualitative approach to fill the literature gap. Twenty-eight articles were reviewed from Scopus, web of science and Google scholar databases from 2000 to 2021. Depending on theoretical background and prior literature, the study expects to assess how Power distance and uncertainty avoidance will have a negative impact on innovation initiation in Arab countries. On the contrary, the document analysis will help ascertain whether individualism and masculinity impact innovation initiation in Arab countries. The theoretical implication will provide insight into the role played by the cultural environment for innovative processes in the Arab regions. The study limitations and future research directions for the Arab regions are presented at the end of the paper.

**Keywords:** *Innovation, culture, Arab countries, World Values Survey*

## **1 INTRODUCTION**

Innovation is a constantly evolving process or change that culminates in value creation. It refers to people's aspirations, private institutions and the government to attain developments through creative ideas. Moreover, it entails developing new products, services, and operations that promote the general quality of life (Odei et al., 2021). Therefore, innovation is crucial for promoting economic growth, increasing competitiveness, and creating new job opportunities for people (e.g. Odei et al.2020; Martin-de Castro, 2015). Innovation in firms is affected by organizational factors, including organizational culture and societal factors including societal culture (Kaasa, 2017).

Culture is considered one of the most important determinants of innovation (Westwood and Low, 2003). A culture that supports creativity does promote innovations. It requires investments in the field of research and development. However, investment in research and development only cannot create a culture that supports creativity. Adopting cultural beliefs and behaviours that promote innovation helps institutions acquire a competitive advantage over their rivals (Chen and Fong, 2015). According to (Kassa and Vadi, 2010), although culture unifies people's behaviours, It may create barriers between them. Moreover, (Wycoff 2003) argues that culture is one of the "Big 10 "innovation killers.

Culture has received much attention in the literature (e.g. Ulijn and Weggeman 2001; Westwood and Low 2003; James, 2005; Taras et al., 2009). Hofstede (2005) defines culture as the way people live. According to Leontiev (2006:52), culture can be defined as "the way of acting in the world, understanding the world, and boundaries that influence the selection of experience in an optimal way". Trinovitch (1980:550) defines it as a communication system involving biological and human behaviour with both verbal and non-verbal communication. The importance of culture comes from the fact that it holds society together and helps individuals in decision-making, development, and many other essential aspects (Kaasa and Vadi, 2010).

The way people behave and think is affected by their culture. This research aims to understand individuals' behaviour regarding innovations and culture and assess the effects of Arabs' culture on innovation initiation, which could be determined the number of trademarks per capita governing 12 Arab countries. These countries include Algeria, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Palestine, Qatar, Tunisia, and Yemen. This study adopts document analysis and a qualitative approach in its methodology to fill the literature gap. Scientific articles in the Scopus, WoS, and Google scholar database was used in the document analysis using keywords concerning the topic. This study adopts document analysis and a qualitative approach to fill the literature gap. Scientific articles in the Scopus, WoS, and Google scholar database was used in the document analysis using keywords concerning the topic. According to Hofstede (2001), four cultural dimensions capture cultural differences. These four dimensions are Uncertainty avoidance, power distance, Individualism-collectivism, and masculinity-femininity. The hypotheses regarding the relationship between the aforementioned cultural dimensions and innovation initiation are based on theoretical background and prior literature. We can summarize these hypotheses as follows:

1. Uncertainty avoidance harms innovation initiation.
2. Power distance harms innovation initiation.
3. Individualism promotes innovation initiation.
4. Masculinity promotes innovation initiation.

## **2 LITERATURE REVIEW**

Hofstede et al. (2005) defined culture as to how people reconcile dilemmas. Many different sets of dimensions are introduced to categorize cultures (e.g. Inglehart & Baker, 2000; House et al., 2002). One of the most widely used measures of cultures during the last three decades in the theoretical and empirical literature is introduced by Hofstede (2001). According to this approach, there are four dimensions of culture: power distance, uncertainty avoidance, individualism-collectivism, and masculinity-femininity.

Power distance shows to what extent the unequal distribution of power, centralized decision structure, and substantial use of formal rules are culturally accepted. Societies with higher power distance and bureaucracy have fewer incentives to innovate (Lee et al., 2020). Many empirical studies support this argument (e.g., Shane, 1993; Williams and McQuire, 2005; Çakar and Ertürk., 2010). Rinne et al. (2012) found a negative relationship between power distance and innovation. Williams and McQuire (2005) argue that power distance negatively impacts economic creativity.

The individualism-collectivism dimension shows to what extent the interests of an individual or a group are more critical (Kaasa and Vadi, 2010). In collectivistic societies, people are more connected to each other loyal to their groups. On the contrary, people are less connected in individualistic societies, and everybody cares about his interests (Hofstede, 2001). It is commonly accepted that innovation is an individual act (Williams & McQuire 2005). This argument is supported by many previous studies (e.g. Lee et al., 2020; Waarts & Everdingen 2005; Kaasa, 2017). Rinne et al. (2013) found a positive impact of individualism on innovation measured by the numbers of trademarks per capita. Williams and McQuire (2005) showed that individualism positively impacts economic creativity. Nevertheless, Kaasa and Vadi (2010) found no relationship between individualism and innovation measured by patenting intensity.

The Uncertainty Avoidance dimension reveals to what extent people tolerate or avoid unfavourable situations. In societies with high uncertainty avoidance, people tend to strictly



follow organizational rules and avoid uncomfortable situations; therefore, a culture with a strong uncertainty avoidance have fewer incentives to innovate (e.g. Waarts and Everdingen, 2005; Williams and McQuire, 2005). Williams and McQuire (2005) found a negative relationship between uncertainty avoidance and economic creativity.

The masculinity-femininity dimension indicates how masculine values such as independence and self-assertiveness are dominant in society (Hofstede, 2001). Some studies argued that masculinity does not affect economic creativity (Williams and McQuire, 2005). Nevertheless, other studies argued that masculinity has a negative impact on innovation initiation (e.g. Hofstede 2001; Kaasa and Vadi, 2010).

Previous studies on Arab countries have established that the United Arab Emirates believes in innovation culture and has been working keenly to promote a rich human resource capable of achieving the national economic growth visions (Johnson et al., 2016). Moreover, studies conducted by different researchers have established that culture impacts innovation initiation. Most aspects of culture demonstrate a significant impact on innovation tendency at the national level (Efrat, 2013). Corporate and innovation culture also plays a vital role in innovation effectiveness, even though little research has been carried out to define this relationship (Dodge et al., 2017). Considering the above and the limited research conducted to investigate the relationship between culture and innovation in developing countries, as most previous studies focused on developed countries, this study seeks to fill this gap by exploring this relationship as one of the least peaceful regions globally.

### **3 METHODOLOGY**

To execute the objective of this study, a qualitative method was adopted by the researchers. The main aim of this paper was achieved through the adoption of document analysis. Document analysis involves the use of printed and online materials for reviewing and evaluating needed literature to conclude a study (Bowen, 2009). Document analysis, which is the scope of the study, has advantages such as no interviews with individuals and easy access to many documents. Some scholars have recently used document analysis in their research (see also Odei et al., 2021; Amoah & Jibril, 2020). This paper's primary source of information depended on keywords search from the Scopus, Web of Science, and Google scholar databases. To achieve the main aim of this study, some articles between 2000 to 2021 connected to the topic were reviewed on Google scholar, Scopus, and WoS, using the keywords search related to the topic of discussion. Out of the numerous literatures downloaded from the specified databases, thirty-five of the articles were used to fulfil the aim of this study. We used articles which were in the English language. Some other source of information was from secondary sources which constitutes the methodology. Some authors recently used document analysis to provide adequate information to this paper (Errichiello & Micera, 2018).

### **4 LIMITATIONS OF THE STUDY.**

Most useful articles were not accessed in some institutional databases due to language barriers and thus were not included in this article. Also results from this paper cannot be generalized in another continent due to different cultural differences.

### **5 THEORY AND PRACTICAL IMPLICATIONS**

In terms of applied contribution to knowledge, it will help in economic growth by assisting governments in the Arab Countries and policymakers in establishing an environment that will contribute to cultural innovativeness. The research outcome will be used as a guideline to the

Arab Countries and researchers on how cultural environment can contribute to a firm's innovativeness.

## 6 CONCLUSION

From the reviewed articles, we can conclude that cultural environment can play an essential role in promoting or stifling innovation. A culture that promotes innovation is paramount to any society as it plays a vital role in the growth and development of an economy. Depending on theoretical background and prior literature, the research expects to establish that Power distance and uncertainty avoidance will negatively impact innovation initiation in Arab countries. On the contrary, the researchers argue that individualism and masculinity will positively impact innovation initiation in Arab countries. As masculinity is a dominant phenomenon in the Arab world, the Arabian society tends not to value any ideas from women (Rizzo, 2014).

## 7 SUGGESTIONS FOR FURTHER RESEARCH

We, therefore, encourage further research to incorporate other cultural environmental neglected factors such as impacts of legislation's ease of doing business that can influence innovation activities other than other factors mentioned in the literature. These will shed more light on the highly probable factors to stimulate Arab countries' innovativeness.

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# OVERCONFIDENCE OF SLOVAK HOUSEHOLDS: EVIDENCE FROM MICRO DATA

*Yuliya Petrenko, Erik Gogola*

## **Abstract**

We study households' overconfidence in financial decision making. We use microdata from the third wave of the Household Finance and Consumption Survey (HFCS) conducted in Slovakia in 2017. Slovak households tend to behave conservatively in regard to investment decision making and participation in the asset market. We focus on households with investments in risky financial assets. In line with previous research, we assume that education positively affects stock market participation and that men are more overconfident than women. For the purpose of the research, we have created an Overconfidence index based on several financial literacy indexes and the participation of households in the asset market. The proposed Overconfidence index has the advantage of being applicable to the data, in which no questions peculiar to the calibration method have been asked. We have examined whether Slovakian households show signs of overconfidence and investigated the possible impact of education and gender on overconfidence. We have used a logistic regression model to examine the influence of the selected factors on the Overconfidence index. We have shown the positive and statistically significant influence of education on overconfidence.

*Keywords: education, financial literacy, gender, households, overconfidence.*

## **1 INTRODUCTION**

For recent decades researchers have actively investigated the internal and external roots of biased decision making in different domains. Nowadays households as the consumers of financial products face a complexity of financial environment with a rising level of responsibility put on them by the government side for their own financial well-being (Campbell, 2006; Brokešova et al., 2017; Bannier, Schwarz, 2018; etc.). In such circumstances, the questions of behavioural aspects influencing the financial decision making of the households are in the sphere of great interest from both micro- and macroeconomic perspectives.

In recent literature on households' financial decision making among the relevant financial spheres is often mentioned asset market participation (Campbell, 2006; Cupak et al., 2020; Gomes et al., 2021; Xia et al., 2014; etc.) considering also experimental asset market investigation (Michailova, 2020b). Among other frequently discussed decision-making areas are pensions in relation to an effective savings plan for retirement. Individuals who are less financially knowledgeable are less likely to think about retirement savings and consequentially reach retirement age with much lower wealth levels than individuals with higher financial literacy (Lusardi, Mitchell, 2006), which in their turn expressed a greater willingness to participate in the voluntary private pension scheme (Brokešova et al., 2017). Concerning the debt side, the literature shows that financially illiterate individuals are more likely to hold a higher share of high-cost credit, have lower net worth, and are more likely to lack confidence when interpreting credit terms. As a result of such behaviour, financially illiterate households are more likely to report difficulties with paying their debts (Disney, Gathergood, 2013). In our paper, we focus on asset market participation, which might be considered as a detector of the investors' well-being (Xia et al., 2014). Households apply stock investment as a tool to generate their income by effective allocation of assets across different time periods (Campbell, 2006).

With our paper, we would like to contribute to the findings on households’ financial decision making taking into account the considerations of overconfidence and financial literacy.

Paper proceeds as follows. In Section 2 a review of the previous main findings on households’ financial literacy and overconfidence concerning households’ decision making are presented. Section 3 describes the methodology of the research, i.e., gives a brief description of the HFCS data used, provides an explanation for the proposed measurement of households’ overconfidence, and elucidates the regression model for identifying the factors, which may influence overconfidence. Section 4 reports the results of the Financial literacy index measurement and the application of the logistic model of overconfidence. Section 5 suggests a discussion, and Section 6 concludes.

**2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

In research studies based on households’ financial surveys (as HFCS or other similar ones in different countries) the authors, which contribute to the fostering of asset market participation, argue that according to the theory such market participation should be higher than it shows up to be according to the surveys data. For example, in the US more than half of the investigated households specified their participation in the risky assets market, but only a tenth part of them (approximately 10%) reported holding bonds or other secured financial assets, which is much lower than the theory predicts (Cupak, 2020). From the data of HFCS it is quite visible that Slovak households tend to hold money on current accounts (see Fig. 1).

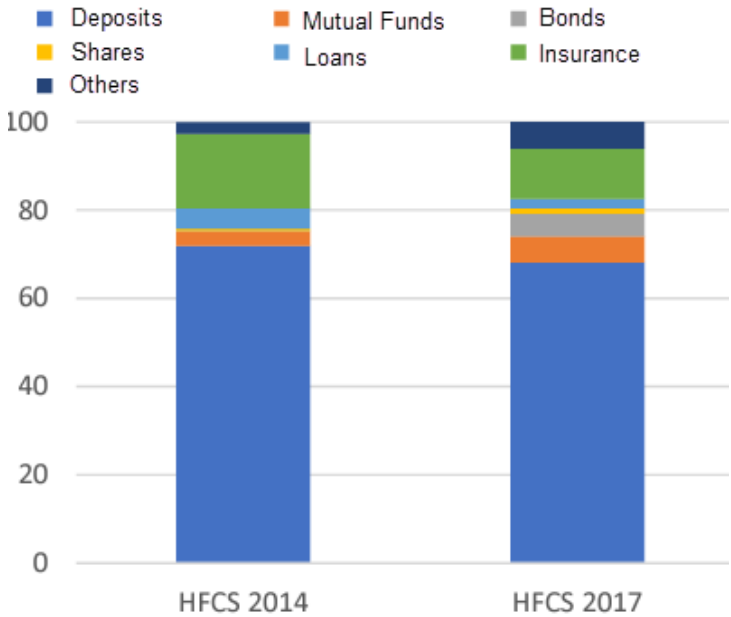


Fig. 1 – The structure of households’ financial assets in Slovakia. Source: Gertler et al. (2019)

Financial assets are concentrated on bank deposits (approximately 70%). The structure of financial assets remains strongly conservative. Even though the remaining financial assets are evenly distributed among other products such as bonds and mutual funds, this is still a negligible share of overall wealth. Considering the poor experience of Slovak households with financial assets, low liquidity of the Slovak capital market, and rising real estate prices, high increments of real assets seem justified (Gertler et al., 2019).

Thus, a question occurs on why some people invest in assets and some do not. As not investing may be considered as a conservative model of financial behaviour, it is interesting to us to make some investigation on why people, who invest, actually do invest. And whether they, for example, are more financially literate, or just somehow overconfident in their financial decisions. And which factors influence such overconfidence in case of its presence? These questions brought us to a closer look at financial literacy and overconfidence issues in households' decision-making process.

## **2.1 Households' financial literacy**

By the most basic definition, financial literacy is mostly connected to a person's ability to effectively manage own personal finances in each area including planning, budgeting, and investing (Remund, 2010). Moreover, financial literacy also expresses individuals' confidence in their abilities to appropriately use skills and knowledge of basic financial concepts, products and services to meet not just their short-term but most importantly their long-term financial goals, with the aim to achieve a lifetime of financial security and well-being (Hung et al., 2009). There are several definitions of financial literacy in the related literature, however, no standardized generally accepted definition or measurement of financial literacy exists in research studies. Therefore, researchers examining financial literacy mostly link the definition of financial literacy with the examined research area, which may be related to stock market participation, retirement savings, debt or investment behaviour, etc.

In our study, we look closely at the investment behaviour of Slovak household through their stock market participation according to the level of objective financial literacy. Lusardi and Mitchell (2007) were the first, who in 2004 tried to measure objective financial literacy by creating a module for the US Health and Retirement Study (HRS), which contained three questions – “Big Three” – regarding financial literacy. These questions were formulated with the aim to measure the basic concepts relating to financial literacy, such as interest rate compounding, effects of inflation, and risk diversification. However, only these three questions can't provide a deep and compressive view of the overall level of financial literacy. Therefore, scholars suggested measuring financial literacy with more accurate metrics.

The combination of objective (actual) and subjective (perceived) financial literacy measured with the help of self-assessment provides a better understanding of the relations between financial literacy and financial behaviour. Perceived financial literacy may more likely reflect the real confidence of individuals in their financial abilities and knowledge. Allgood and Wallstad (2012) used a combined measurement of financial literacy that included objective (actual) and subjective (self-assessed) financial literacy. They examined the impact of identified financial literacy on different financial behaviour including investment behaviour. They found that adults with high perceived and actual financial literacy are 21% more likely to have financial investments in stock, bonds, and mutual funds than those adults who have low perceived and actual financial literacy, which confirmed the fact that these adults are more capable of building higher wealth through investing. What is even more important is that when they hold actual financial literacy at a low level, adults with high perceived financial literacy compared with those with low perceived financial literacy are 11% more likely to have financial investments and 7% more likely to have over half of their financial investment in stocks or mutual funds that contain stocks.

The study by Van Rooij et al. (2011) investigates the role of financial literacy of Dutch households on stock market participation. They measure financial literacy by dividing the question into two categories. The first category measures basic financial literacy related to basic numerical ability, interest compounding, and understanding of inflation. The second category questions were intended to measure more advanced financial literacy and covered topics such

as the difference between stocks and bonds, the function of the stock market, diversification, etc. The study found that only less than a quarter of Dutch households (23,8%) own stock or mutual funds and most of these households display higher levels of “advanced financial literacy” and are more likely to participate in the stock market than households with lower level of “advanced financial literacy”.

## **2.2 Overconfidence in financial decision making**

It is widely assumed that people in general are overconfident (Michailova, 2010a). Kahneman argued that the reason of overconfidence is in placing too much faith in intuitions instead of relying on cognitive effort. In his words, people “apparently find cognitive effort at least mildly unpleasant and avoid it as much as possible” (Kahneman, 2011). In the frame of the paper, we do not go deeply into psychological aspects of overconfidence but look at it from an economical point of view.

Ackert and Deaves (2010) defined overconfidence as “the tendency for people to overestimate their knowledge, abilities, and the precision of their information, or to be overly sanguine of the future and their ability to control it”. In accordance to the definition given, the common approach to overconfidence in financial literature (Ackert, Deaves, 2010; Michailova, 2010b; etc) provides for such its forms as: (1) miscalibration – the tendency to believe that person’s knowledge is more precise than it really is; (2) better-than-average effect – the tendency to rate yourself above average on different attributes; (3) illusion of control – the tendency to think that people have more control over events than objectively can be true; and (4) excessive optimism – the tendency to assign probabilities to favorable/ unfavorable outcomes that are just too high/low given historical experience or reasoned analysis. The main circumstances of overconfidence in financial decision-making of investors are that they trade too much, under-diversify their portfolios, and take on too much risk (Ackert, Deaves, 2010). In more recent research Moore and Schatz (2017) point out at necessity of comparison between beliefs and reality in measuring overconfidence and suggests the following classification of overconfidence forms: (1) overestimation – a belief that people are better than they are; (2) overplacement – a belief that people are better than others; and (3) overprecision – sureness of people that they know the truth.

We found those approaches to systematization of overconfidence forms quite similar, and if we intended to combine the previous two classifications based on Moore and Schatz (2017) description, we would mention three forms in such relations: (1) illusion of control and excessive optimism together relate to overestimation; (2) better-than-average effect pertains to overplacement; and (3) miscalibration concerns overprecision. The abovementioned or similar forms seem to become common for overconfidence discussion, although Ackert and Deaves notify that, while separating the forms is straightforward in theory or some hypothetical examples, “in reality it is not always easy to tease out the different strains of overconfidence” (Ackert, Deaves, 2010).

Overconfidence measurement applies different tools and technics. In general, there are no widely accepted methods of measuring individuals’ overconfidence. The two main approaches consist of measuring overconfidence by proxies or different tests depending on the research questions and methodology (Michailova, 2010a). The proxy approach does not allow for overconfidence numerical determination. The example of using proxy for measuring the degree of overconfidence for the US stock market is given in Statman et al. (2006), which applied the high past returns for this purpose, arguing that successful investment in previous periods increases the level of overconfidence (for more examples on overconfidence proxies, see Michailova (2010b)). Another example of using a proxy is given by Blavatsky (2008), who



employed a task for the measurement of overconfidence. The researcher gave a choice to individuals to bet on their own knowledge or alternatively on the equivalent lottery, and those who bet on their own knowledge were classified as overconfident, while others were identified as underconfident. Tests or questionnaire approach in its turn allow for numerical determination of the individuals' under- or overconfidence. It employs different tests: either with some discrete items probability elicitation or interval elicitation tests (Michailova, 2010a). For implementing such measurement, subjects are asked to answer the questions or complete the tasks in the first step, and in the second one – to estimate the probabilities of the correctness of their answers or the successfulness of the task completion.

In empirical research authors use approaches for overconfidence measurement related to other relevant variables. For example, to show a positive correlation between perceived confidence in own financial skills and asset participation Cupák et al. (2020) applied a variable, which was related to the future macroeconomic development of the US economy in 5-year horizon. The study from Xia et al. (2014) measured overconfidence using financial literacy as the difference between consumers' subjective and objective financial literacy scores. The result is the following: being overconfident in own level of financial literacy will increase the likelihood of stock market participation (by approximately 20%). These results suggest that high perceived financial literacy and overconfidence can be as or even more important than actual financial literacy related to financial market participation.

Concerning the approaches for overconfidence investigation, some authors define the impact of overconfidence on financial decision making, market functioning, and other economic outcomes (for example Statman et al. (2006) provide the overconfidence impact on trading volume in the market), and others tend to estimate the influence of different variables on its value. Among the most frequent variables of impact on overconfidence are stated: education and gender, income, marital status, presence of children, etc. (Banner, Schwarz, 2018). We follow that direction and estimate the overconfidence of Slovak households along with factors that influence such overconfident behaviour. For such factors we selected the most frequently occurred in the existing literature regarding overconfidence, namely education and gender (Banner, Schwarz, 2018). We hypothesize that education and gender have an impact on overconfidence in financial decision making, and we have two research questions:

RQ 1: Does overconfidence in financial decision-making is determined by the education level of the household's reference person?

RQ 2: Does the gender of the household's reference persons influence the overconfidence concerning financial decision-making?

### **3 METHODOLOGY**

#### **3.1 Data**

We use the data of Household Finance and Consumption Survey (HFCS), a cross-country survey collecting household-level data in the eurozone, coordinated by the ECB and prepared in accordance with the common methodology when each NCB/NSI finances and conducts its own survey. The HFCS database is a probability sample of households, meaning that there is always a weight connected to each sampled household. Therefore, during the computation of different statistics outcomes, it is necessary to take into account the final sample weights, which

confirm the representativeness of the sample at a country level. The survey frequency is every 3 years since 2010, and the latest wave was collected in 2021 (no open data yet).

We used the latest publicly available wave of Slovak HFCS data collected by the National Bank of Slovakia in 2017. HFCS data contains information regarding households' financial situation and their balance sheets such as households' assets, liabilities, income, and expenditures. Moreover, the HFCS data accommodate detailed information regarding individual household demographic characteristics as gender, education, employment, and marital status. The final sample of the Slovak HFCS data from 2017 consists of 2178 households with 10895 observations. HFCS data include a set of questions on financial literacy, namely on understanding fundamental concepts concerning personal finance including interest rates, inflation, riskiness, and diversification of portfolios. These questions were answered by the reference persons of the selected households.

### **3.2 Measurement of households' overconfidence**

As to measure overconfidence first we need to derive the variables from the data. Whereas our database does not contain variables that most of the reviewed studies used as a proxy for overconfidence, we created our own proxy variable for overconfidence. We identified households' overconfidence concerning financial decision-making as follows.

First, we measured the level of financial literacy. The HFCS 2017 micro data contains four questions regarding financial literacy in order to discover the ability of households (namely their reference persons) to understand the basic concepts of personal finance including interest rates, inflation, the riskiness of financial products, and portfolio diversification. Subsequently, we created a dummy variable for each question related to financial literacy according to the correctness of the answers. If the question was answered correctly the dummy variable is 1 and 0 otherwise. Thus, we have four questions related to financial literacy, therefore the Financial literacy index ranges between 0 and 4. Further, we define as low financially literate the households with correct answers lower than 3 (in other words, households who correctly answered only 0 to 2 questions), similar to Guiso and Viviano (2015). And for robustness check we re-estimate our definition of low financial literacy as follows. First, we have considered those households, who were able to correctly answer to 0 and 1 question, as low financially literate. The second definition of low financial literacy was defined for households, who correctly answered 3 or fewer questions (in other words, only households with all four correct answers were considered as highly financially literate).

The second variable, which is included in our Overconfidence index, are households that have investments in risky financial assets such as mutual funds, bonds, or publicly traded shares. Each variable contains binary values, from which we derived the dummy for households with risky investments equals to 1 and 0 otherwise. To measure the overconfidence of households we combined two derived variables together. In our study, we consider households as overconfident if they display low financial literacy according to our different types of definitions of low financial literacy combined with investments in one of the predefined risky assets (mutual funds, bonds, or publicly traded shares). Subsequently, we created the households' Overconfidence index as a dummy variable, which reaches a value of 1 if the households display low financial literacy and simultaneously have an investment in one of the risky financial assets, and 0 otherwise.

Therefore, for measuring overconfidence according to the available data, we use an approach, similar to Blavatsky (2008), which (Michailova, 2010a) identified as a proxy one. Blavatsky (2008) provided subjects the option to choose the bet on their knowledge/ability or otherwise the lottery equivalent to that bet. Then he identified those, who chose to bet on their own

knowledge or ability, as overconfident, and others as underconfident. We define investors as overconfident according to their choice, though unlike the abovementioned research we don't ask the subjects to make their choice but check the households' real decision making: if the household demonstrates low financial literacy and participate in the asset market by investing in one of the mentioned risky financial assets. Subsequently, we identify the household as overconfident (overestimating own knowledge in form of financial literacy, which is substantial for investing).

### 3.3 Regression model for identifying the factors of influence

We used a logistic regression model to examine the influence of the selected factors, namely education and gender, on Overconfidence index (measured as described above). In the proposed model overconfidence is used as a dependent variable, while education and gender are used as independent variables. We also used several additional variables influencing overconfidence, such as age and income. The baseline model in this study is given as follows:

$$Overconfidence_i = \beta_0 + \beta_1 Gen_i + \beta_2 Age_i + \beta_3 Inc_i + \beta_4 Educ_i + \varepsilon_i \quad (1)$$

where *Overconfidence* is the Overconfidence index, which is a dependent dummy variable equal to 1 if the  $i^{th}$  household has low financial literacy and invests in one of the predefined risky financial assets (that we assume as overconfidence of the households), *Educ<sub>i</sub>* and *Gen<sub>i</sub>* are the variables for education and gender respectively; *Age<sub>i</sub>* and *Inc<sub>i</sub>* are stated for age and income respectively; and  $\varepsilon_i$  is the error term.

## 4 RESULTS

As HFCH data only contains information regarding objective financial literacy, in the first step we look more precisely at the overall level of financial literacy of Slovak households. Since we can only evaluate the financial literacy of the interviewed individuals, we consider their answers as the answer of the household, whereas we assume that those individuals were the most competent members of the household to answer questions related to financial literacy and their opinion have the significant weight in the household financial decision making.

The HFCS data contains financial literacy questions to measure the ability of households to correctly answer questions regarding interest rates, inflation, the riskiness of financial products, and portfolio diversification. The difficulty level of questions increases gradually. We created our Financial literacy index as a sum of binary variables. If the household answered the financial literacy question correctly the value is 1 otherwise 0. Thus, for each household, the Financial literacy index range between 0 and 4. Most of the households' representatives could correctly answer to more than 2 questions out of 4 questions (the average value of the number of correct answers across households was 2.38). However, a significantly lower part of households was able to answer to all four financial literacy question correctly (only 12%), while half of the respondents in Germany (50%) and one third of the respondents (36%) in Finland were able to correctly answer all four similar financial literacy questions (Koenen, Lusardi, 2011; Kalmi, Ruuskanen 2017). From such a comparison we may conclude that the overall level of financial literacy among Slovak households is rather low.

The distribution of answers across different households suggests that the lowest financial literacy was observed among households in the lower-income quintiles. Regarding the economic status, we could observe the lowest financial literacy among unemployed, and financial literacy slightly decreases within higher age categories. On the other hand, higher financial literacy was observed among households in higher-income quintiles. We can also

observe a small gender gap in financial literacy, where males show a slightly higher Financial literacy index, as well as the percentage of all correct answers is higher by males.

Tab. 1 – Financial literacy across reference persons. Source: own calculations based on HFCS (2017)

	# of correct answers	All correct
<b>Overall</b>	2.38	0.12
<b>Income quintile</b>		
1 <sup>st</sup>	2.09	0.05
2 <sup>nd</sup>	2.27	0.09
3 <sup>rd</sup>	2.34	0.12
4 <sup>th</sup>	2.48	0.14
5 <sup>th</sup>	2.72	0.18
<b>Age group</b>		
Under 35	2.38	0.12
35-44	2.54	0.15
45-54	2.42	0.11
55-64	2.38	0.12
65-74	2.30	0.09
75 and over	2.11	0.08
<b>Gender</b>		
Male	2.43	0.13
Female	2.27	0.10
<b>Education</b>		
Primary or no education	NA	NA
Secondary	2.31	0.09
Tertiary	2.66	0.21

Most of the households (82%) was able to correctly answer the first question regarding financial literacy on distinguishing between the fixed and adjustable interest rates of mortgages. Almost all households (90%) correctly answered the second question concerning inflation and its effect on savings and purchasing power. The third question was concerning portfolio diversification and the riskiness of different investment strategies. Only around a half of the households (47%) could correctly answer this question. The fourth question regarding investment product riskiness was the least correctly answered question (only 20% of households answered this question correctly). These results confirm that Slovak households are quite familiar with the work of interest rates and understand the effects of inflation, on the other hand, they lack knowledge concerning investment, the riskiness of different investment products, and the importance of portfolio diversification. The results are in line with the real investment behaviour of Slovak households, which hold most of their financial assets on deposit or savings

accounts (Jurašeková Kucserová, Strachotová, 2019). Most of the households (92%) own some type of financial assets, but only a small share of them (4.5%) own one of the pre-defined risky financial assets.

Subsequently, we select the portion of households, which we assume to be overconfident, by using our pre-defined proxy for the overconfidence to prove our hypothesis. We found that in our selected sample men and women do not show the statistically significant association with overconfidence (see Tab. 2). On the other hand, we proved a statistically significant and positive relationship between education and overconfidence. We conclude that from the selected independent variables in our sample only education has a statistically significant positive impact on overconfidence (the odds of being overconfident are predicted to increase about 2.7 times for each additional level of education achieved). We assume that the slight difference in financial literacy and investment in risky financial assets among women and men in our sample could determine the results achieved, as we could not identify the statistically significant relationship between gender and overconfidence.

Tab. 2 – The effect of demographics on Overconfidence index.

Source: own calculations based on HFCS (2017)

	(1)	(2)
VARIABLES	Logit coef.	Odds ratio
Overconfidence		
Gender	-0.505 (0.470)	0.604 (0.284)
Age	-0.0844 (0.151)	0.919 (0.139)
Income	-2.09e-07 (1.06e-05)	1.000 (1.06e-05)
Education	0.996** (0.428)	2.708** (1.160)
Constant	-5.826*** (1.035)	0.00295*** (0.00305)
Observations	10,895	10,895

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Tab. 3 – The effect of demographics on Overconfidence index II.

Source: own calculations based on HFCS (2017)

	(1)	(2)
VARIABLES	Logit coef.	Odds ratio
Overconfidence II		
Gender	0.0375 (0.330)	1.038 (0.343)
Age	0.0294 (0.0968)	1.030 (0.0996)
Income	2.43e-05*** (7.28e-06)	1.000*** (7.28e-06)
Education	0.860*** (0.299)	2.364*** (0.706)
Constant	-5.661*** (0.789)	0.00348*** (0.00275)
Observations	10,895	10,895

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

As a robustness check we re-estimated Overconfidence index in order to test whether we may achieve stronger association between gender and overconfidence. We designed the Overconfidence index II, where we have considered households, who were able to answer three or fewer financial literacy questions correctly and simultaneously hold one of the predefined risky financial assets, as overconfident. The results of the robustness check are presented in Table 3 and they support our previous findings from the baseline model. The association between gender and overconfidence remains not statistically significant even though our sample size increased as we increased the low financial literacy threshold level. The association remains positive and significant in the case of education and subsequently income became a variable with statistical significance. The last design of Overconfidence index included households who display low financial literacy (only 0 or 1 correct answer) and simultaneously hold one of the predefined risky financial assets. However, in this case the sample of households did not reach the size sufficient for obtaining statistically significant results.

## 5 DISCUSSION

We believe our paper benefits the research field of household decision making concerning determinants, which explain the behavioural aspects of finance, namely overconfidence. The

Overconfidence index serves the same purpose in measurement overconfidence as the calibration method, though does not require the application of additional questions specific for calibration (assessing the probability of respondents' correct answers). Therefore, our proposed Overconfidence index may be used for the type of data, where no questions peculiar for the calibration method, were asked. Thus, it can also be used for retrospective analysis of overconfidence as when we investigate the past and look at how the overconfidence developed, we can also use the abovementioned kind of data.

We consider all households, which have low financial literacy and still participated in the asset market, as overconfident, and our study indicates that education has a positive impact on overconfidence bias in financial decision making, which is in line with earlier studies (Bhandari, Deaves, 2006; Deaves et al., 2010, Mishra, Metilda, 2015). According to our second research question, the data for men show slightly higher financial literacy measured with all applied indices as well as slightly higher investment in risky assets, however, it is not reflected in overconfidence and the difference appears to be not statistically significant. The findings of previous studies are contradictory. We will continue investigating the reason why gender is statistically insignificant using the data of the HFCS as most previous research studies proved the impact of gender on overconfidence showing that males are more overconfident in most cases (Barber, Odean, 2001; Briel et al., 2020; Hardies et al., 2013; Mishra, Metilda, 2015; etc.). We may assume that in study by Mishra et al. (2015) the gender relationship is statistically significant according to the cultural differences. In Slovakia women make more financial decisions, and even though men and women in the same positions are still not always paid the same, they make decisions at the same level. Thus women in Slovakia seem to be more experienced, which cause less gender difference. Moreover, in our study we assume that the absence of gender influence on overconfidence may be explained by (self-)selection. The results of Hardies et al. (2013) showed that (self-)selection can eliminate the gender difference in overconfidence. We assume the fact that people chose to invest as (self-)selection, and thus the absence of gender influence on overconfidence is in line with Hardies et al. (2013).

## 6 CONCLUSION

In the paper we have examined the influence of education and gender on overconfidence in financial decision-making behaviour using households' Financial literacy indexes and asset market participation. Firstly, we have analysed the overall financial literacy among Slovak households, and we have found that most of the households could correctly answer to more than 2 questions out of 4 (the average value of the number of correct answers is 2.38 out of 4 possible) and significantly lower part of households was able to answer to all four financial literacy questions correctly (only 12%). These findings suggest that Slovak households have a relatively low level of financial literacy compared to other EU countries, e.g. Germany or Finland. We found that higher financial literacy is observed among households in higher-income quintiles, and in the middle-age group of respondents. We have also observed a minor gender gap in financial literacy showing that males have a slightly higher Financial literacy index as well as the percentage of all correct answers.

We used the analyses of financial literacy for creation of the Overconfidence index (measuring the investments in at least one of the risky financial assets relative to financial literacy). We used logistic regression for analysis of the factors influencing the Overconfidence index. Our underlying hypothesis is that education and gender have an influence on overconfidence in financial decision making. We confirmed statistically significant positive relationship between education and overconfidence, which remains statistically significant also in the results of the

robustness check (with a re-defined Overconfidence index). We assume that the absence of gender influence on overconfidence in our study is due to (self-)selection.

Thus, according to our findings, from the selected demographics in our sample (education, gender, age, and income) only education has a statistically significant positive impact on overconfidence. This means that educated people are showing low or modest financial literacy and they are endangering their savings and investments. This may be considered as a field for further research in the area of overconfidence in financial decision making in Slovakia.

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# **SOCIALLY RESPONSIBLE HUMAN RESOURCE MANAGEMENT AND EMPLOYEE RETENTION**

*Nhat Tan Pham, Ha Thanh Nga*

## **Abstract**

Socially responsible human resource management (SRHRM) has been playing more vital role in organization competitiveness. By replying on corporate social responsibility to implement HRM practice towards employee directly, SRHRM has become significant strategy of most companies. This empirical study investigates the links of SRHRM to employee retention, besides the mediating effects of employee shared values and relationship satisfaction in association with SRHRM and retention are also examined. By using PLS-SEM analysis, this study aims to explore the relationship between SRHRM and employee retention as well as the mediating roles of employee shared value and relationship satisfaction towards this link. After months to collect data, 400 respondents who working in a wide range of multinational companies (MNCs) in Viet Nam were gathering to examine the proposed hypotheses. The findings of this study demonstrated that SRHRM strategy was important to directly enhancing employee retention and shared values. Besides the direct effect of SRHRM and retention, employee shared values was also found positively affect to relationship satisfaction combine with the positive relation of relationship satisfaction with retention had pointed out the mediating roles of shared values and relationship satisfaction in association with SRHRM and retention under MNCs in Viet Nam context.

***Keywords:** Socially responsible human resource management, shared values, relationship satisfaction, retention, organizational competitiveness.*

## **1 INTRODUCTION**

Corporate social responsibility (CSR) has become widespread recently. This is because organization fully comprehend how important to follow socially responsible behaviour to get stakeholder support due to demands about social concerns. In addition, socially responsible human resource management (SRHRM) practices, the term indeed derived from CSR practices use to applied on employee directly is getting more pay attention from scholars and organizational needs as well for long term competition (Aguinis, 2011). This study mainly focused on the influence of SRHRM to employee retention so as to get better understanding of employee behaviour with socially responsible behaviour of their organization.

Newman et al., 2015 believed that although the general functions of SRHRM may be similar within organizations, the specific context of the organization may influence the SRHRM activities, policies, and implementation. Furthermore, each organization located in different countries may vary SRHRM activities as a result of its outcomes differently. Therefore, SRHRM is increasingly being recognized as a crucial aspect of organizational effectiveness.

SRHRM is a set of practical action reply on CSR practices to affect employee level with regard to gain benefit of employee, organization and stakeholders (Shen and Benson, 2014). Making use of SRHRM practices was recommended by scholars aims to improve social contribution of employee, it could lead to satisfy by customer, stakeholders and employee themselves. In fact, some previous studies had found positive impact of SRHRM towards financial performance (Peloza, 2009), competitiveness and long-term growth (Edmans, 2012). Besides, the significant links of SRHRM and employee attitude such as employee satisfaction, employee

well-being and employee behavior as work performance, their intention to quit, also are recorded (Shen and Benson, 2014; Kundu and Gahlawat, 2016). According to Sobhani et al, 2021, SRHRM experienced the significant negative effect on employee's desire to quit which mean the retention remain stable. However, it is necessary to have more empirical research between the links of SRHRM and retention. Kundu and Gahlawat (2016) discovered SRHRM practices help to significantly decrease employee turnover rate by the mediating role of job satisfaction. Employee satisfaction in work relationship were primarily paid more attention from scholar over years. The more employee fulfillment about the relationship in the workplace via their job, their colleagues and management, the less absenteeism was witnessed which can lead to decrease employee's desire to leave. According to traditional research, job satisfaction is something that working people seek and a critical component in employee retention, which can only be attained by making the employee feel comfortable physically and psychologically.

Jia et al, 2019 found that SRHRM practices occur to encourage employee perceived respect and to facilitate proactively employee' sharing. Although it seems remain risks of working when employee share their work knowledge with someone else due to underestimate the value of knowledge (Connelly et al., 2011; Milliken et al., 2003), shared values where employee interact with another one brings more benefit than shortage of interaction in organization. This can help to build a sense of community and a common goal of achievement. It can also demonstrate how an employee's values match up with what they doing, subsequently impact on employee relationships.

Although such studies have more paid attention to SRHRM practices and its outcomes, there is no empirical evidence to support SRHRM practices in relation to shared value, relationship satisfaction and employee retention in which need to do more in-depth investigation. For this reason, to fill the gap, this study wants to bring an additional insight about how SRHRM practices impact on their intention with work under the MNCs in Ho Chi Minh City, Viet Nam context. In particular, on the one hand the direct effect of SRHRM and employee retention will be evaluated, the other hand, the indirect effect of SRHRM and employee retention will also be explored by examining the mediator roles of shared values and relationship satisfaction.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

SRHRM is defined as CSR's aim towards employees to improve employee welfare, working conditions and also encourage them to participate in community social responsibility goals so that they can be proud due to meaningful for what they doing. According to social exchange theory, which supported to this construct, has pointed out social relationships and human behavior reply on cost – benefit analysis so as to determine putting much effort into the relationship maintenance. According to Gahlawat et al., (2018), SRHRM and employee work attitudes have a good relationship. SRHRM aids in better aligning people's interests, values, and goals with the organization's aims and values, which promotes workers to work with more positive work attitudes, hence improving their employment attitudes such as dedication and satisfaction with the organization. The negative correlation of SRHRM and employee intention to leave was recorded by findings of Sobhani et al., 2021; Kundu and Gahlawat, 2016 assist to sew the argue of retention in organization is remaining stable. Practically, due to demanding of global social norm it is undeniable employee behavior as work performance, motivation, organizational identification response reply on organization by its CRS practices (Shen and Benson, 2014). The successful of SRHRM practices in organization, the result in employee engagement, commitment with their work to be reinforced. This support to the direct relation between SRHRM and employee retention. Thus, the hypothesis was proposed:

*H1: SRHRM is positively associated with employee retention.*

Shared values play an important role in “defining organizational culture and influence between organizational members” (Morgan, 1994). The interaction of employee-to-employee be influenced by the view of organization's SRHRM actions, the explanation for this is that with appropriate approach by management practices to motivate the environment where interpersonal obstacles be eliminated, employee willing to exchange information, knowledge with partners in terms of solving common issues of organization (Jia et al, 2019). It seems support the reciprocal relationship among organization’s values and employee when two parties have common belief of goal, behavior, intention. The result in sense of shared values within organization be boost by management actions effectiveness which lead to the links of SRHRM and employee shared values. Based on the theoretical evidence, the hypothesis was proposed:

*H2: SRHRM is positively associated with employee’s shared values.*

Following social exchange theory, when it comes to consider a specific the relationship between person and person which always will be support by trust-based relationship due to nothing relationship happen without trust first (DeConinck, 2010). In particular, when employee feel free and willing to share knowledge and information about work with another one which also mean improving working relationship better. In others word the link between shared values with employee’s relationship satisfaction worthy be take into account.

Hendrick et al. (1988) developed the concept of relationship satisfaction which described as an appraisal of one's partner's good feelings and attractiveness to the relationship from an interpersonal perspective. Following of Boutmaghzoute & Moustaghfir (2021) finding has showed when employee satisfaction higher, which can lead to employees quitting or leaving their jobs lower.

As such, based on the previous evidence presented above, the following hypotheses of this study were proposed:

*H3: Employee’s shared values are positively associated with relationship satisfaction.*

*H4: Employee’s relationship satisfaction is positively associated with employee retention.*

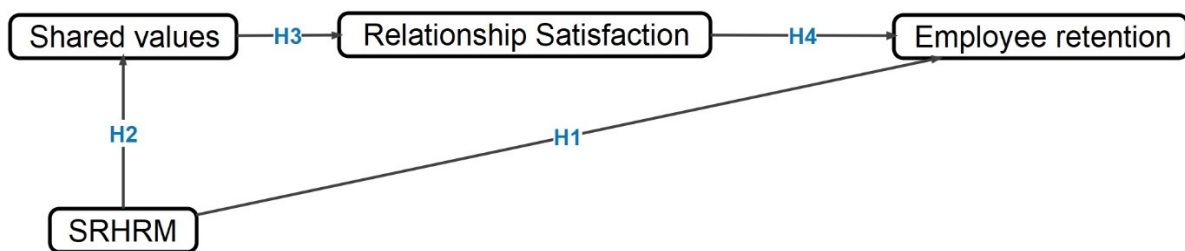


Fig. 1 - Proposed model of the relationship among SRHRM and Employee Retention

### 3 METHODOLOGY

#### *Research design*

Initially, preliminary research is delivered to collect more information background relevant to the relationship of SRHRM and employee retention. The context of this study is applied in multinational corporations (MNCs) in Ho Chi Minh City, one of the largest metropolitan city in Viet Nam with a majority type of company such as small and medium size enterprises (SMEs), multinational corporations (MNCs) and Start – ups. Meanwhile, MNCs played an essential role in related to adopt CRS practices into organization sustainability strategies than

rest (Bilowol & Doan, 2015). Thus, the investigation in MNCs in Ho Chi Minh City can be used to generalize the impact of SRHRM to employee retention, as well as to recommend SRHRM initiatives to MNCs and other companies executives for future strategy.

The quantitative method was used to examine the proposed relationship of SRHRM. Particularly, reliability and validity test by using SPSS 20 to evaluate the scale of measurement with the study. Structural equation modeling (PLS-SEM) was conducted to test the fit of model as well as to examine the links of proposed hypothesis by Smart PLS 3.0.

#### *Data collection and sampling*

Questionnaire were used to collect primary data during the data collection process. The convenience sampling method is adopted in the first step of collecting data. It is witnessed some advantages of using convenience sampling as comparatively fast, low cost and the validity of samples selection. Google Form was used to create questionnaire with proper instruction to ensure get correct feedback of respondents working in MNCs. Thanks to consent of HR department, the survey questionnaire was sent to all means of communication of MNCs' employee under a short link. Respondents were required to answer all items of survey, to avoid bias of correspondent feedback, it is not necessary for respondents to fill their name on the survey. During the period of months, 400 surveys handed out to MNCs' employee, 363 were returned, 13 incomplete surveys were discarded due to missing data, hence 350 complete answers are usable in the quantitative analysis stage which cover 87.5 % response rate.

#### *Measurement*

This study adopted independent variables and dependent variable based on scope and existing scales. There are three independent variables namely SRHRM, Shared Values and Relationship Satisfaction and one dependent variable is Employee Retention. SRHRM was measured using the six-item scale which adapted and validated by Shen and Benson, (2016). Four items were adapted and edited from Kuvaas et al., (2012) to measure Shared Values and three- items from Hendrick et al., (1988) to measure Relationship Satisfaction. Employee Retention was adapted from Kyndt et al., (2009) and consists of eight items. A total of 21 items were developed from previous studies to measure the links of SRHRM and Employee Retention of MNCs' employee Ho Chi Minh City, Viet Nam. All the above items were measured by five-point Likert Scale with strongly disagree (1) to strongly agree (5).

#### *Data analysis*

##### *Sample descriptive analysis*

This study uses six demographic variables such as gender, age, education, seniority, position, and MNCs sector are presented in table 1. The sample consists of 47.1% male, and 52.9% female. Regarding age, a majority of respondents from 23 to 45 years old (75.5%) while youngest age group lower 22 years old (5.4%) and age group older than 45 years old (19.1%) account for a minor percentage. In terms of education background, 92.5% respondents had obtained at least college or university degree. Seniority of respondents showed that over 70% (70.9%) respondents with working experience 4 – 10 years and junior employee consist of 72.3% out of samples. There are five groups MNCs sector were divide separately. Processing, and Manufacturing group account 32.3% which largest proportion, following by Serving, Tourism and Trading group make up 25.1%. These two groups occupied more than 50% compared to rest MNCs sector on this survey.

Tab. 1 - Demographic variables of sample (source: own research)

Variables		Frequency	Percentage (%)
Gender	Male	165	47.1
	Female	185	52.9
Age	<22	19	5.4
	23 – 30	150	42.9
	31 – 45	114	32.6
	> 45 years old	67	19.1
Education background	High school	26	7.4
	Vocational college	243	69.4
	University	81	23.1
	Postgraduate	0	0
Seniority	1 – 3 years	62	17.7
	4 – 5 years	149	42.6
	6 – 10 years	99	28.3
	> 10 years	40	11.4
Position	Junior employee	253	72.3
	Senior (team leader, deputy, manager)	97	27.7
Sector	Architecture, Construction, Art and Design, Ads	60	17.1
	Processing and Manufacturing	113	32.3
	Education	54	15.4
	Service, tourism, trading	88	25.1
	Others	35	10

After gathering demographic information of MNCs respondents, quantitative test was deployed to evaluate fitness of model study so as to examine the relationships of SRHRM by PLS-SEM. The quantitative method used this stage including reliability and validity based on common measures, such as Cronbach's alpha, the exploratory factor analysis (EFA) to ensure measurement scale of study qualify statistical requirement before running the structural equation modeling (SEM).

#### *Reliability test*

In order to test the reliability of scale, Cronbach's coefficient alpha and Composite Reliability (CR) were conducted by SPSS. The result indicated Cronbach's alpha of scale were higher than 0.7 and CR results range from 0.883 to 0.924. Thus, all scales satisfied the requirement for reliability test (Peterson and Kim, 2013).

#### *Validity test*

Convergence values, discriminant values and exploratory factor analysis (EFA) were examined to evaluate validity of this model before conducting test of proposed hypotheses by path analysis (Anderson & Gerbing, 1988; Babin et al., 2008).

The outer loading coefficients and Average Variance Extracted (AVE) are used to compute the convergence value of latent variables. The result of AVE has shown this value ranges of model scale from 0.534 to 0.791 (greater than 0.5) and the outer loading coefficients of the observed variables range from 0.630 to 0.908 (greater than 0.6). This mean convergence validity of model scale qualified (Babin et al., 2008).

In order test discriminant validity, Fornell - Larcker criterion and the Heterotrait - Monotrait Ratio criterion (HTMT) be used, the result in all square roots of AVE with coefficients greater than 0.5 imply the Fornell-Larcker criterion satisfied (from 0.731 to 0.889). The square root of AVE is larger than the correlation coefficient of other values in the same column for each value. The result also presents HTMT is less than 0.9. Thus, discriminant validity was confirmed (Leguina, 2015; Fornell and F. Larcker, 1981).

Tab. 2 - Reliability and validity result (source: own research)

Latent constructs	Cronbach's Alpha	Composite reliability	Average variance extracted
SRHRM	0.893	0.919	0.656
Shared values	0.823	0.883	0.655
Relationship Satisfaction	0.868	0.919	0.791
Employee retention	0.906	0.924	0.605

The exploratory factor analysis (EFA) was conducted by SPSS 20, has shown the result that scales satisfied of requirement with factor loadings ( $>0.5$ ), KMO's value between 0.5 and 1, p-value is less than 1%, total of variance extracted and the number of factors extracted are satisfied (Anderson & Gerbing, 1988).

## 4 RESULTS

The table 3 depicts the results of the structural equation modeling measure the relationship of SRHRM and retention. The t-value was used to estimate the statistical significance of each path coefficient, the correlation among the remaining relationships in the model is statistically significant at 5%. Hypotheses H1, H2, H3, H4 are therefore accepted. Specifically, H1 ( $\beta=0.190$ ,  $p<0.005$ ), H2 ( $\beta =0.459$ ,  $p<0.005$ ), H3 ( $\beta =0.493$ ,  $p<0.005$ ) and H4 ( $\beta =0.393$ ,  $p<0.005$ ). As a result, we may conclude that 4 proposed hypotheses of this study are accepted by PLS - SEM test. Supporting for the relationship of SRHRM with retention.

Tab. 3 - Hypothesis testing result (source: own research)

Hypothesis	Relationship	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values	Decision
H1	SRHRM → Employee Retention	0.191	0.058	3.267	0.001	Supported
H2	SRHRM → Shared values	0.46	0.043	10.783	0.000	Supported
H3	Shared Values → Relationship Satisfaction	0.493	0.047	10.376	0.000	Supported
H4	Relationship Satisfaction → Employee retention	0.393	0.053	7.383	0.000	Supported

### *Mediating effects of Shared Values and Relationship Satisfaction*

The mediating effects will be confirmed when independent variables influence dependent variables, not only require the relationship between independent variable and mediating variables are significant but it also the links of mediators and dependent variables must be significant (VanderWeele et al., 2012). Structural analysis depicts the positive significant of H2, H3, H4 and H1. It is also means that Shared values and Relationship Satisfaction mediate partially the association of SRHRM and retention.



## 5 DISCUSSION

This study aims to evaluate the association of SRHRM to retention. The proposed hypotheses based on social exchange theory and social learning theory were tested using PLS-SEM. The findings have shown the significant positive effect of SRHRM and employee retention under MNCs Viet Nam context. This aligns with prior studies about organization outcomes and its implementation of CSR practices such as Boutmaghzoute & Moustaghfir (2021), Sobhani et al. (2021). Also, the mediating effects of Shared Values and Relationship satisfaction in association of SRHRM and retention is confirmed on this study. It implies the essential role of SRHRM in terms of boosting a positive shared environment to enhance the working relationship towards employee commitment. This finding also suited with DeConinck (2010) mentioning about the role of CSR practice to create knowledge sharing and satisfaction of employees in organization. Basically, the investigation provided empirical evidence about the links of SRHRM, Shared Values, Relationship Satisfaction and Employee Retention with the context of MNCs in a developing country, Viet Nam.

## 6 CONCLUSION

To sum up, by exploring the impacts of SRHRM to employee retention in MNCs Viet Nam context. The findings of this study contributed to theory of CSR implementation for improving organization strategy sustainability in general. The significant positive effect of SRHRM to employee behavior such as their willing to share working knowledge and working relationship effectiveness also were witnessed from this study. This study also provided practical contribution to MNCs management in terms of positive outcomes of employees, organization and society for applying socially responsible behaviors.

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# ASSESSMENT OF GREEN CONSUMER BEHAVIOUR AMONG GENERATION Y IN THE CZECH REPUBLIC

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## **Abstract**

The main objective of this paper is to assess the adequacy and reliability of the collected data using the adopted scale of green consumer behavior and then conducting exploratory factor analysis to determine the constructs' reliability and the internal consistency of individual items. A questionnaire survey was carried out for this purpose. The green consumer behavior scale was used for the study's purposes. The first step was to use Jamovi software to assess the adequacy of the collected sample data using the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity, followed by an analysis of the collected data's reliability using Cronbach's alpha. After ensuring adequacy and reliability, Adanco software was used to perform exploratory factor analysis (EFA).

Desirable values of composite reliability are found for the preference factor and consumers' willingness to pay a higher price. Higher than desirable values for consumer focus on the environment and tolerance of possibly lower quality 'green' products indicate that some claims fulfilled some elements of duplication or redundancy. Furthermore, this reveals the fact that Generation Y customers recruited for this study are more inclined towards eco-friendly products and are even willing to compromise on the quality demanded of green products.

The study discovered interesting patterns in establishing the fact that Czech Republic Generation Y consumers prefer green products and are willing to change their consumption habits to meet environmental needs.

**Keywords:** *CSR, Green Consumer Behaviour, Green Consumer, Generation Y, Scale*

## **1 INTRODUCTION**

In connection with the expected significant increase in world population after World War II (Desmond, 2003, p. 95) draws attention to the emergence of the Green Revolution, which emphasized a rational and scientific approach to production. Other authors have suggested that sustainability is of fundamental importance for the survival of humanity and is therefore an urgent research topic (Chabowski et al., 2011; Kumar & Polonsky, 2017; Lim, 2015). The foundations for the perception of the concept of sustainability were laid by Brundtland with his definition of sustainable development, in which he points to the fact that the needs of the current generation must not be prioritized over the needs of future generations. According to (Wagner, 2005, p. 1), most Western markets are influenced by green consumer behaviour, which reflects consumer concerns about the environmental impacts of product production and consumption. With this impulse, legal changes began to be discussed at individual levels (European Commission, 2020; Government of the Czech Republic, 2022; Ministry of Industry and Trade, 2022; United Nations, 2015).

Compared to previous generations, Generation Y lives in a global world (Průša & Sadílek, 2019) and the amount of Generation Y surpasses even the most numerous groups of baby boomers to date and thus represents an important demographic group for marketers (Schiffman & Wisenblit, 2015, p. 334). The importance of creating specific marketing strategies aimed at generation Y is also underlined by the fact that in 2015 the purchasing power of this generation amounted to almost 2.5 trillion dollars (Barnes & Lescault, 2014). Green consumer behavior

represents a social value for the consumer, strengthening his self-concept and connection to his peer group (Papista et al., 2018). Furthermore, in this regard, consumers of Generation Y can positively influence each other and thus establish themselves as a model of good behavior (Aagerup & Nilsson, 2016; Diekmann & Franzen, 1999; Moses, 2000). The strength of green behavior also defines 2 of the 6 types of Generation Y consumers, namely "Clean and Green Millennials" and "Anti-Millennials" (Schiffman & Wisenblit, 2015, p. 336). Generation Y is a generation, which is far the most oriented on consumption, but at the same time a very socially, culturally and ecologically aware generation (Sullivan & Heitmeyer, 2008). Generation Y individuals believe that global climate change is a direct result of human activity, not natural processes, and are twice as likely to buy green products (Hsu et al., 2011). At the same time, studies refer to this generation as the key generation for defining the theoretical concept of sustainable consumption (Lee, 2008; Prakash & Pathak, 2017) and the leaders of the modern green movement (Kanonuhwa & Chimucheka, 2014).

Thus, given the size of the Generation Y age cohort, or echo boomers, and the current emerging issues regarding sustainable consumption, this paper will therefore focus on examining the green consumer behaviour of Generation Y.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

### **2.1 Green Consumer Behaviour**

Sustainable or green consumer behavior was one of the first areas explored within the literature in the 1970s (Kumar & Polonsky, 2017; McDonald et al., 2009), while issues of sustainable or green consumerism are still intensively studied.

Green consumer behavior represents the decision to purchase an alternative green product based on awareness of the consequences of this purchase, subsequent use, and its disposal (Henion & Kinneer, 1976; Moisaner, 2007). Another definition of green consumer behavior comes from the authors Grunert and Kristensen (Grunert & Kristensen, 1990; Wagner, 2005, p. 205) states that such thinking consumers are environmentally oriented consumers. They then defined these consumers as people who are aware that the creation, dissemination, utilize, and disposal of products incur significant external costs and strive to minimize these costs through their behavior and purchasing decisions. In contrast, the author, Peattie (Peattie, 2001) states that there is no such thing as a green consumer or a green purchase, and it is only a series of inconsistent and unrelated purchases. Other studies also reveal conflicting results, and it is not clear why environmental concerns do not always translate into environmentally friendly actions or activities and ecological consumer behavior (Biswas, 2017; Shiel et al., 2020).

One of the defined divisions is the subdivision of green consumers into 3 groups, namely ecological activists, ecological eaters, and savers (Schiffman & Wisenblit, 2015, p. 320). According to Mintz McBride (2011, p. 33), green consumers are divided into 5 groups, and these true greens, donor greens, learning greens, non-greens, and anti-greens. According to Schiffman & Wisenblit (2015, p. 319) caring for the environment represents for consumers their personal sense of responsibility for the environment, for the impact of their purchases on the environment, and the willingness to sacrifice their personal comfort for the good of the environment. Other studies (McCarty & Shrum, 1994; Narula & Desore, 2016; Triandis, 2016) suggest a link between levels of collectivism and individualism with green consumer behavior. Individuals with collectivist traits tend to be more environmentally friendly than individuals with individualistic traits who focus more on their independent self.

Pedersen & Neergaard (2006) state that models of value attitudes were created to explain the internal and external factors that influence the behavior of green consumers. These models

include The Environmental Value-Attitude-System Model by Dembkowski & Hanmer-Lloyd (1994), Causal Model of Environmental Research by Kilbourne & Beckmann (1998), or, for example, Model of organization of the Consumer's Value System created by Vinson et al. (1977).

Wagner (2005, p. 1) assumes that up to 70% of consumers consider environmental issues in their purchasing decisions. Other authors (Peattie, 2001; Wong et al., 1996) then state that, according to surveys among consumers who are environmentally oriented, the number of these consumers incorporating environmental issues into their purchasing decisions is relatively stable. Green consumers often choose companies that are environmentally friendly. This part of the company's responsible behavior is part of corporate social responsibility, or corporate CSR. With so many conflicting goals and objectives of stakeholder groups, the definition of CSR is not always clear. McWilliams & Siegel (2001) defines CSR as activities promoting a certain *“social good, beyond the interests of the firm and that which is required by law”*.

The author (Imkamp, 2000) compares the results of two studies from 1989 and 1998 examining patterns of consumer behavior and their changes and the perceived risk associated with product choice, particularly the search for ecological properties of products by consumers. In the first study, the ecological properties of the products did not appear to be a significant factor for consumers, but in the second study in 1998, there was a significant increase in the importance of this factor in consumer decisions.

Researching green consumer behavior can be done, according to (Wagner, 2005, p. 2), bring answers to a long series of unanswered questions across various academic disciplines, from economics, psychology, sociology to theology. These include, for example, the attitude-behaviour gap (Hughner, 2007, p. 103), the choice of products based on political, religious, or social motives (Harrison et al., 2005, p. 14; Parsons & Maclaran, 2017, p. 151), the quality of knowledge of green consumers (Wagner, 2005, p. 18), the socioeconomic profile of green consumers (Wagner, 2005, p. 17), the influence of media reports on the occurrence of green consumer behavior (McDonald et al., 2009) or the influence of the cultural environment on consumers by Şener & Hazer (2008). Along with other cultural differences, different values of individual cultures are also found, which, according to the author, De Mooij (2019, p. 31), are also stable within generations. Some values are found across cultures, but in some they are more prevalent than in others.

## **2.2 Generation Y**

The pioneer of the theory of generations was the German sociologist Karl Mannheim (McCourt, 2012), who explained the concept of a generation as a group of people at the same developmental age, with similar social and historically significant events, thanks to which they developed some similar connecting elements (İlhan, 2020). In his opinion, individuals within one generation can show similar attitudes, behavior, beliefs, expectations, and shared values. The current labor market is dominated by generations Baby Boomers (1946-1964), Generation X (1965-1979), and Generation Y (1980-2000). The authors Průša & Sadílek (2019) also identify with the given temporal definition of generation Y. In contrast, Schiffman & Wisenblit (2015, p. 334) define Generation Y as an age cohort representing people born between 1980 and 1996.

Compared to previous generations, Generation Y lives in a global world and is also called millennials (Průša & Sadílek, 2019) or the generation of 2001 (Zemke et al., 1999), the Nintendo generation or, for example, the Internet generation. As another designation, the authors (Schiffman & Wisenblit, 2015, p. 334) also mention millennials or echo boomers. Furthermore, according to (Saxena & Jain, 2012), this generation is used to observe quick

results, even in the case of a job promotion, for example. Dhevabanchachai & Muangasame (2013) states that in a situation where they are not satisfied with working conditions, higher remuneration or management style, they change jobs and do not plan to wait years for a possible change of unsatisfactory conditions in the current company.

According to D'Amato & Herzfeldt (2008), Generation Y individuals attach high importance to acquiring new work skills for their professional development. Pinzaru et al. (2016) emphasize that individuals of generation Y grew up in families in which they were directly involved in decision making (including the associated responsibilities), which is the reason why they expect certain decision-making rights in their work position. Caruana & Vassallo (2003) point out that openness and democracy within the family have a positive effect on the involvement of children in decision-making during the purchase process. At the same time, however, according to Pinzaru et al. (2016), they do not respect the status of the position in the work organizational structure, which is the reason why they often choose flexible and project work programs in which the hierarchy of workers is not strictly built.

Schiffman & Wisenblit (2015, p. 334) states that generation Y surpasses even the most numerous groups of baby boomers by their number and thus represent an important demographic group for marketers. The problem marketers face when targeting this generation is that Gen Y is exposed to a wide variety of media options. Thus, they become immune to traditional marketing tools. The authors Průša & Sadílek (2019) also draw attention to the importance of developing specific marketing strategies aimed at Generation Y. The importance of creating specific marketing strategies aimed at generation Y is also underlined by the fact that in 2015 the purchasing power of this generation amounted to almost 2.5 trillion dollars (Barnes & Lescault, 2014). According to (Průša & Sadílek, 2019), Generation Y is less loyal to brands and changes its habits, style and way of communication at a faster pace, which, according to Schiffman & Wisenblit (2015, p. 334), also stems from the fact that they are becoming immune to traditional marketing tools.

### **2.3 Generation Y and Green Consumer Behaviour**

Papista et al. (2018) states that green consumer behavior represents a social value for the consumer, enhancing his self-concept and connection with his peer group. Peer groups have a direct and indirect influence on green consumption, green lifestyle, and promote environmental emotions and passion, leading consumers to green purchasing behavior. Aagerup & Nilsson (2016) further emphasize that the choice of a green product or the product of a company that has adopted the concept of green marketing can become a correct or correct social behavior and a certain status of an individual in society. Therefore, the consumer can strive for self-expression by choosing green products. Other studies also contradict this claim (Diekmann & Franzen, 1999; Průša & Sadílek, 2019). Moreover, in this regard, according to (Moses, 2000 p. 98), consumers of generation Y can positively influence each other and thus establish themselves as a model of correct behavior.

Schiffman & Wisenblit (2015, p. 336) point out that the power of green behavior also defines 2 of the 6 types of Generation Y consumers. These specific types of Generation Y are the so-called "Clean and Green Millennials" and "Anti-Millennials". The first group are "Clean and Green Millennials", who take care of themselves and their surroundings. They support their surroundings, are guided by ecological issues, and philanthropy and a positive approach to life are important to them. The sophistication of millennials is also highlighted by Průša & Sadílek (2019). The second group are the so-called "Anti-Millennials", who focus on their own well-being and the well-being of their family, thereby avoiding the general norms of Generation Y. They are not interested in buying green products and their purchases are made with the aim of ensuring their well-being and comfort.

According to (Sullivan & Heitmeyer, 2008, p. 287), Generation Y is generation, which is far the most oriented on consumption, but at the same time a very socially, culturally and ecologically aware generation. However, Generation Y individuals are highly skeptical and require rational justification from those around them. According to the authors Kanonuhwa & Chimucheka (2014), Generation Y is referred to “as the new leaders of the modern green movement” because, according to Hsu et al. (2011), this generation has unique characteristics that, as consumers, are significantly influence during their purchasing behavior. Generation Y individuals believe that global climate change is a direct result of human activity, not natural processes, and are twice as likely to buy green products. Since, according to studies (Hume, 2010; Lee, 2008; Pra & Sadílek, 2019), generation Y is a generation very receptive to innovative ideas, it is possible for researchers to use more sophisticated methods to understand the sustainable consumption of Generation Y consumers. At the same time, studies (Lee, 2008; Prakash & Pathak, 2017) identify Generation Y as a key generation for defining the theoretical concept of sustainable consumption.

### 3 METHODOLOGY

The main objective of this paper is at assessing the adequacy and reliability of the collected data through the adopted scale of green consumer behaviour from the authors Průša & Sadílek (2019) and the subsequent execution of exploratory factor analysis to determine the reliability of the constructs and the internal consistency of individual items, see Fig. 1.

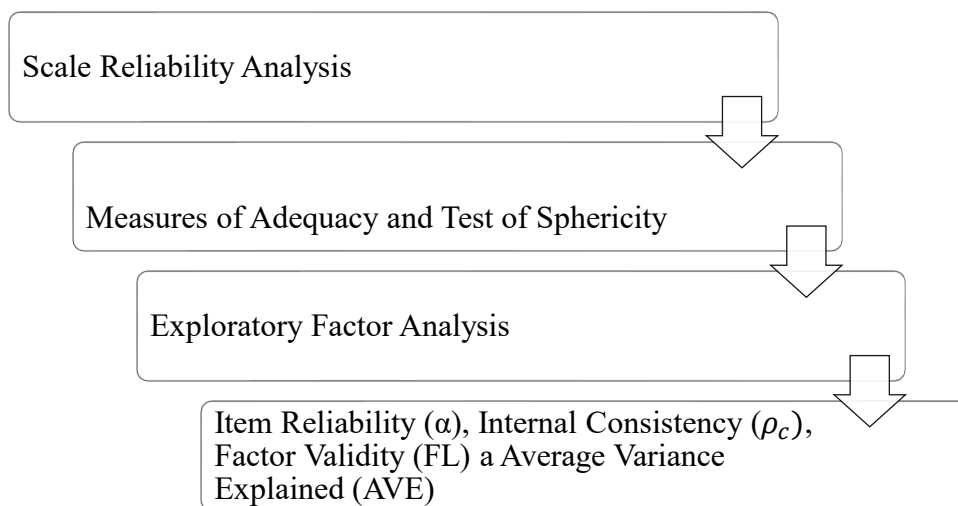


Fig. 3 – Research Methodology Flowchart. Source: own research

For this purpose, a questionnaire survey was conducted. To define this demographic cohort, the definition of Průša & Sadílek (2019) and İlhan (2020), who state that these are consumers born between 1980 and 2000, was followed. For the purpose of the research, the green consumer behaviour scale by Průša & Sadílek (2019) was adopted.

The first step was to use Jamovi software to assess the adequacy of the collected sample data according to the Kaiser-Meyer-Olkin measure (KMO) and Bartlett's test of sphericity, and then to analyse the reliability of the collected data using Cronbach's alpha; see finding in Tab. 2. After the adequacy and reliability were met, exploratory factor analysis (EFA) was performed in a second step using Adanco software. This analysis was conducted to determine the reliability of the constructs and the internal consistency of the individual items; see findings in Tab. 3.

The sample of respondents consisted of 48 Czech students, representatives of Generation Y. In terms of gender, there were 25 women and 23 men. The questionnaire was standardised,



conducted electronically, and consisted of 4 questions. The questionnaire had dichotomous questions (1., 2.) regarding Generation Y classification and nationality, polytomous questions (3.) regarding gender, and one scale or Likert scale (4.) consisting of multiple sub-questions. In view of the fact that this analysis was conducted to determine the reliability of the constructs and the internal consistency of each statement, the research was directed only at the scaling question and the other questions were for filtering purposes only.

The scale consisted of responses of Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree. The scale question is designed to examine 4 aspects related to green consumer behavior, namely consumer focus on the environment (ENV), consumer focus on companies with socially responsible behavior (PRE), consumers' willingness to pay extra for "green" products (PAY), and tolerance of possible lower quality of "green" products (TOL). The individual constructs are further branched into the following items in the Tab. 1.

Tab. 1 – Identified constructs and items as result of exploratory factor analysis. Source: Průša & Sadílek (2019)

<b>Construct</b>	<b>Items</b>	<b>Statements</b>
<b>ENV</b>	ENV1	I am interested in ecology and environmental protection.
	ENV2	I am interested in whether companies behave responsibly towards the environment.
	ENV3	Environmentally friendly products are of higher quality.
<b>PRE</b>	PRE1	I prefer products from environmentally friendly companies.
	PRE2	A company's CSR is important to my product decision.
	PRE3	Green products are more trustworthy for me.
<b>PAY</b>	PAY1	I will pay extra for a product if I know its manufacturer is environmentally friendly.
	PAY2	Price is not the most important criterion for me when buying consumer goods.
<b>TOL</b>	TOL1	I tolerate a lower quality product if it is made by an environmentally friendly company.
	TOL2	I can tolerate a worse shape of the product if it was produced by an environmentally friendly company.

## 4 RESULTS

The first step was to assess the adequacy and reliability of the collected sample. According to Field (2018, p.1014), KMO values between 0.7 and 0.8 tell us that the sample selection is adequate at the middling level. A value of 0.5 or less is referred to as inadequate sample selection. According to Field (2018, p. 1015), the results of Bartlett's test of sphericity tell us, based on the p-value, how significantly different from zero the variables used in the study are correlated. According to Hulin Charles & Cudeck Robert (2001), the globally accepted values of " $\alpha$ " range between 0.588 and 0.753. According to the authors, Hulin Charles & Cudeck Robert (2001), values above 0.8 indicate a robust level of reliability.

Tab. 2 - Assess of Data Adequacy and Reliability. Source: own research

Name of Test or Analysis	Symbol	Value
Kaiser-Meyer-Olkin measure	<b>MSA</b> (measure of sampling adequacy)	0,761
Bartlett's test of sphericity	<b><math>\chi^2</math></b> (approx. Chi-Square)	317
	<b>df</b> (degree of freedom)	45
	<b>p-value</b> (Sig.)	< 0.001
Cronbach's alpha	<b><math>\alpha</math></b>	0,830

The KMO of the collected sample is 0.761, which indicates the adequacy of the collected data. The results of Bartlett's test of sphericity provide sufficient evidence to state that the variables used in the study are significantly correlated with each other (p-value <0.001). The value of Cronbach's  $\alpha$  is 0.830, indicating a robust level of reliability. See these findings in Tab. 2.

After adequacy and reliability were met, an exploratory factor analysis (EFA) was performed. See these findings in Tab. 3.

Tab. 3 - Exploratory Factor Analysis. Source: own research

Construct	Item	FL	$\alpha$	$\rho_c$	AVE
ENV	ENV1	0.9842	0.9691	0.9796	0.9413
	ENV2	0.9454			
	ENV3	0.9806			
PRE	PRE1	0.8444	0.7045	0.8362	0.6306
	PRE2	0.8015			
	PRE3	0.7324			
PAY	PAY1	0.9185	0.7053	0.8685	0.7679
	PAY2	0.8320			
TOL	TOL1	0.9430	0.8489	0.9293	0.8680
	TOL2	0.9202			

Jöreskog's  $\rho_c$  was used to express *Composite Reliability*. According to the authors (Ryu et al., 2010), a desirable level  $\rho_c$  between 0.69 and 0.91. Then Cronbach's  $\alpha$  was evaluated as a measure of the *reliability of the construction*. Subsequently, *Average Variance Extracted* (AVE) was used to assess interfactor influence. According to (Perry Stephen, 2018), the threshold value is  $AVE > 0.5$ . The last step was to determine *Factor Loadings* (FL), i.e., what weight is assigned to each factor. According to the authors, Ford et al. (1986), the minimum factor loading criterion is a value of 0.5.

Regarding the results of the  $\rho_c$  column, the constructs PRE (preference) and PAY (willingness of consumers to pay a higher price) are within desirable values, with values of 0.8362 for PRE and 0.8685 for PAY. Higher than desirable values  $\rho_c$  for ENV and TOL point to the fact that some claims fulfilled certain elements of duplication or redundancy. The results of the  $\alpha$  column show that all values are higher than 0.588, so it can be concluded that all constructs are reliable. Regarding the results of the AVE column, all the values are higher than the cut-off value of 0.5,

which means that the between-factor influence is not high. Regarding the results of the FL column, all values are higher than 0.5, which means that the weights assigned to individual statements within the constructs are high.

## 5 DISCUSSION

Although green consumerism is not an emerging concept in the European Union, as Brundtlandian philosophies have been at the centre of the sustainable discussion since decades. Contemporary research in green consumerism, have however shifted focus from manufacturing orientation to customer centrism. In the same vein, our study aims to address sustainable consumption through a consumerist perspective. Similar studies in the past have helped to drive the narrative of the role of “young people” in the green consumption continuum. The current study reflects extant scholarships by authors like (Kyroglou et al., 2022) who reveal robust evidence of sustainable consumption among the young generation customers in the United Kingdom and Greece. In a cross market study of Generations Z, Y, X and baby boomers, (Cui et al., 2022) indicate that awareness of sustainable consumerism is high among the younger generational cohort. (Sharma et al., 2022) comment that green loyalty, which represents the psychological disposition toward green products remain higher in Generation Y than the millennial generation. And finally, in a fuzzy set examination of consumption choice, (Pauluzzo & Mason, 2021) reveal that Generation Y have higher propensity towards green fashion and are more than willing to shun non-sustainable apparels.

Given the above premises, it can be generalized from this investigation that Generation Y customers recruited for this study are more inclined towards eco-friendly products (ENV3 = 0.9806) and are even willing to compromise on the quality demanded of green products (TOL1 = 0.9430, TOL2 = 0.9202). Interest in the study captures the implication of CSR activities on the consumption behaviour of Generation Y through the items ENV2, PRE1, PRE2, PAY1, TOL1 and TOL2. The study reflects upon the observations of Moses (2000 p. 98), Peattie (2001), Wong et al. (1996) and Wagner (2005, p. 1) who revealed the stability of consumers who exhibit proclivity toward green products and their implications on green norms.

It is also necessary to take into account that the studies to date have been carried out mainly in relatively stable economic conditions and not in periods of pandemic or military conflict, which may have some impact on central European consumers. These new socioeconomic conditions, which have been very dynamic over the last three years, call for further research in the field of green consumer behaviour and open up a discussion on its future development.

## 6 CONCLUSION

The study found interesting patterns in establishing the fact that Generation Y consumers of the Czech Republic are prone to green products and are willing to alter their consumption behavior according to the environmental needs. This study was conducted on a small scale; future research is recommended to use a larger sample size. The investigation also lagged the theoretical lense, as the primary goal was to investigate a specific behavioural scale in the context of the Czech Republic. Subsequent research should focus on inclusion of the scales used in this study in theories so as to extend the same. The study of this scale deserves further research, especially to verify the occurrence of duplication and redundancy. Focusing researchers on other generational groups separately or a larger sample of respondents may also offer interesting comparisons to compare green consumer behaviour across generations.

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# THE BIOPLASTICS MARKETING COMMUNICATION ON SOCIAL MEDIA: PROMOTING SUSTAINABILITY DELIVERED BY INNOVATIVE MATERIALS AND PRODUCTS

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## **Abstract**

The aim of the study is to examine the marketing communication of Czech companies that introduce various innovative bioplastic products to the Czech market social media. For this study, the companies Nafigate Corporation, Nilmore<sup>®</sup> and Frusack were selected because they are all pioneers and their products are related to different customer needs, ranging from cosmetics to clothing and shopping bags. Based on the quantitative and qualitative approach of content analysis, it was found that the companies are most active on the Instagram and Facebook platforms, offering alternative products that help customers and society deal with some of the environmental, as well as non-environmental, issues. All three companies are trying to combat plastic waste and pollution through novel products that are reusable, compostable, degradable, or circular and are based on or contain bioplastics. However, they do not present their products under the general term “bioplastic”, but use the description of their origin or the chemical abbreviation in their advertising and communication. The products contain PLA, cPLA or P3HB, which are derived from renewable resources such as corn starch and waste oil. They are manufactured locally in the EU and can be perceived as a more sustainable alternative to conventional goods even in terms of their disposal. All of the above-mentioned companies have also been awarded a title or a prize related to the sustainability of their products or operations.

**Keywords:** *bioplastics, marketing, communication, sustainability, social media, CSR*

## **1 INTRODUCTION**

Plastic pollution is considered one of the current global environmental problems (Liu et al., 2020). The lack of degradability of plastics, leading to increasing pollution of soils and waters by plastics, together with the expected shift away from landfilling, has led to the development of biodegradable plastics (Shah et al., 2008), which is also accompanied by the substitution of fossil-based plastics (Calabrò and Grosso, 2018). Considering that not only plastics as we know them, but also microplastics are ubiquitous, these efforts become even more compelling and challenging (Lots et al., 2017). However, so-called bioplastics include not only those made from renewable biological resources, but also those that are biodegradable, or those that are both biodegradable and made from renewable biological resources (Imre and Pukánszky, 2013). Bioplastics are considered one of the most innovative materials of the 21<sup>st</sup> century (Arikan et al., 2021). For successful innovation, production, market introduction, adoption, and competitiveness of bioplastic, the demand side is crucial, and consumers need to be informed and convinced about the environmental benefits of this change (Wellenreuther, Wolf and Zander, 2022). This is where the task of appropriate marketing communication for bioplastics arises. Although global leaders and brand owners, including BASF, DuPont, NatureWorks, and Coca-Cola, are actively working to find effective ways to communicate and present the value and benefits of such products (Jaconis et al., 2019), bioplastics, like other green and sustainable products, are often negatively impacted by communication chaos or greenwashing practices (Tkaczyk, Kuzincow and Ganczewski, 2014). Rhen (2020) notes that bioplastics are indeed a communication problem, but their uptake could be improved by linking bioplastics to the company’s sustainability strategy. As a result, this could help improve the company’s image

and reputation, increase market share, create a new market, or obtain government subsidies and various grants. The aim of this study is to examine the marketing communication of bioplastics on social media by the Czech companies that have introduced such products to the Czech market. For this purpose, the following research questions were posed:

*Research question 1: How active are companies in promoting bioplastics on social media?*

*Research question 2: How are they promoting them on social media?*

*Research question 3: Are they promoting them as a sustainable alternative?*

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

A company's reputation in relation to its environmental and social responsibility is critical to trigger the purchase of sustainable products from that company. Nevertheless, corporate commitments to sustainability or corporate social responsibility (CSR) vary, and there are still many traditional companies, that prefer strong branding or products over sustainability. Yet, following the current market trend, traditional companies are also trying to introduce sustainable products (Carter, Jayachandran and Murdock, 2021). As a result, many companies, are turning to green marketing to improve their image, branding, reputation and CSR, and to promote and induce environmentally conscious consumption (Khan et al., 2021). Bioplastics are considered a novel, specific type of green product that is still the early stages of mass commercialization. Although not much is known about consumers attitudes toward these products, it was found through the focus group method that consumers would readily adopt these alternative products when the perceived value is higher, but also when the potential positive environmental effect is clearly stated. Perceived value is generally influenced by green self-identity and self-congruence. The use of social marketing activities is recommended for companies to influence and shape consumer attitudes, intentions and awareness (Confente, Scarpi and Russo, 2020). However, the problem with the current marketing of bioplastics lies in the companies' claims, which are often misleading or false, as some of them tend to greenwash their products when promoting them. A seawater degradation experiment of plastic products sold in the U.S., Canada and Brazil that are advertised as biodegradable or 100% degradable depicted greenwashing practices. The experiment focused on changes in the structure and chemical composition of the products and showed that 40% of the samples showed no signs of degradation within 180 days. In addition, the researchers found that even bags that claim bio/degradability are made of polyethylene or other common non-biodegradable plastics, which is counterproductive and deceives consumers (Nazareth et al., 2019). A literature review discovered that the problem lies not only in companies making false and misleading claims about products, but also in the confusing terminology used for bioplastics. In the absence of reliable information to the public about the properties of these products, including their degradability, companies easily use greenwashing to entice purchases with false promises about the product's environmental benefits (Goel et al., 2021). Companies that are able to mobilize their sustainability capabilities, and communicate the added value of the novel materials' better performance and lower environmental impact can effectively bring bioplastics to market, as demonstrated by case studies of industry leaders in traditional plastics manufacturing that have introduced various bioplastics, namely DuPont, BASF, and Braskem. In addition to communicating the sustainability of these products, they are also leveraging the power of relationships and collaborating with society, customers and suppliers to co-create value. There is a need to communicate the future benefits of such products, which may be based on better biodegradability, recycling, agricultural practices, use of renewable resources, closing the loop at the end of the product's life, or a combination of these (Iles and Martin, 2013). As for the appropriate means of marketing communication for bioplastics, a survey revealed, that social

marketing campaigns could encourage consumers, businesses, and government entities to use bioplastics to behave more environmentally responsibly and be seen as environmentally conscious. Purchase intention depends on attitudes toward bioplastics, subjective norms, and plastic reduction activities, but may also be triggered by perceived social pressure (Taño, Méndez and Díaz-Armas, 2021). Another study notes that the bioplastics market still offers little information and lacks marketing activities aimed at end users. A survey conducted among Italian consumers found that the environmental properties of bioplastics are more important than the non-environmental properties and can influence purchase intentions. Similar to the above research, subjective norms are important for this intention, but unlike in all the above-mentioned studies, the cost of bioplastics compared to conventional plastics appears to be another key variable (Notaro, Lovera and Paletto, 2022). The guided interviews with experts from the fashion retail and supply industry conducted in Germany revealed that bioplastics can lead to higher sustainability if bioplastic-based clothing is recyclable and can be returned via reverse logistics and if the bioplastic packaging for garments is compostable. These innovations can be influenced and moderated by both ecological/environmental orientation and economic interests (Friedrich, 2021). However, a method triangulation of in-depth interviews, a focus group, and semi-structured surveys found that the level of waste management of compostable packaging is low due to lack of regulations, inadequate communication, and poorly developed recycling infrastructure. Greenwashing also interferes with communication, as consumers do not know how to properly dispose of and separate waste (Raźniewska, 2022). Yet, for instance there is a company that is particularly concerned with waste. This company is Componenti Plastici Biodegradabili, an Italian manufacturer of bioplastic food packaging manufacturer, which aims to become a social entrepreneur through initiatives and investments in CSR related to the social and environmental impact on local communities and addressing food waste and food safety issues. These intentions are supported by social marketing campaigns on Facebook and Instagram, helping not only to spread information about the initiative and the company among consumers, but also to attract new suppliers and partners. The company sponsors other initiatives and partners with other organizations dealing with sustainability. As a result, these activities lead to an increase in ROI, market share, visibility and business opportunities for the company, but can be further linked to the Sustainable Development Goals (SDGs), namely no poverty (SDG 1), zero hunger (SDG 2), sustainable cities and communities (SDG 11), responsible consumption and production (SDG 12) (Perlini, 2022). The overlap of bioplastics with the SDGs is also discussed in other studies. In the case of a bioplastic made from mixed feedstock consisting of *Miscanthus* and winter wheat straw, a case study looking at feedstock supply and PBS production scenarios notes, that the scenarios directly address climate change mitigation, therefore climate action (SDG 13), indirectly zero hunger (SDG 2), and that such a type of bioeconomy can contribute to a better life on land (SDG 15) (Ni et al., 2021). In the case of using inedible cellulose as a feedstock for bioplastics, it is expected to address not only above-mentioned SDG 2, SDG 11, and SDG 13, but also SDG 9 (industry, innovation, and infrastructure) (Nag et al., 2021). The SDGs were introduced as universal goals for sustainable development. There are links between CSR and the SDGs, as CSR evolves and is influenced by the SDGs, and the activities of organizations' CSR activities are usually aligned with these goals (ElAlfy et al., 2020).

### **3 METHODOLOGY**

This study is based on content analysis, using both qualitative and quantitative approaches to capture communication activities and content. Content analysis can be applied to various data sources, including textual, visual, or audio files (Kleinheksel et al., 2020).

In the Czech Republic, social networks are used by more than 4.7 million people, which is 54% of the population aged 16 and older. In 2019, 49% of companies with ten and more employees had a profile on social networks such as Facebook, but only 9% on networks such as Twitter (so-called microblogs) (CZSO, 2020a). Among large companies, social media are used by 76%. Companies also use other types of social media such as YouTube to share their multimedia content. Social media allow them to present and promote their company, provide relevant information, build relationships and interact with users, monitor what they think about their products or services, improve them, find new employees, but also better target advertising to the right audience (CZSO, 2020b).

Since social media enable the sharing of various types of content, including audiovisual content, the chosen method is suitable to examine the marketing communication of Czech companies producing various goods from bioplastics or containing them. In this paper, the marketing communication of the companies Nafigate Cosmetics, Nilmore<sup>®</sup> and Frusack in the social media YouTube, Twitter, Facebook and Instagram is analyzed. All companies have launched innovative products. Nafigate Cosmetics is a company that specializes in cosmetics, Nilmore<sup>®</sup> focuses on clothing and Frusack on reusable packaging. Not all of the companies' products are bioplastics. Although the non-relevant content could be disregarded, I think it is important to go through it to get a better overview of the companies' social media activities and description of their marketing communications, and to see the bioplastics communications in the larger context of the rest of the posts. For this overview, I will identify the creation of the account, the total number of posts, and the current number of followers, but also go through the content published. To answer the first research question, a quantitative approach will be used to determine the total number and frequency of posts on bioplastics by each company. To answer the second research question, a qualitative approach will be used to find out the ways in which they promote it, focusing on how they communicate it, but also on the content itself and the themes occurring. To answer the third research question, I will use a qualitative approach by searching through posts that associate bioplastics or products that contain bioplastics with sustainability. The data will be obtained directly from the companies' social media profiles, and the analysis will include all data types, including textual and audiovisual data. Since there is a problem with the so-called "stories" that disappear 24 hours after uploading, they will be neglected in this analysis, although some companies may save some of them. The information provided by the selected companies on their social media profiles is also included, as it provides a brief description of the company's activity that is relevant to marketing communications and the brand. The analysis covers the period from the creation of the accounts to 07/07/2022.

## 4 RESULTS

As shown in Tables 1 and 2, YouTube and Twitter are social media that companies use only to a small extent for their marketing communications. YouTube is used by only two companies (Nafigate Cosmetics and Frusack). Few people follow either channel, and both are used to communicate products, with Frusack being careful to present the idea behind the product as an alternative to single-use plastics. This is quite understandable, as their product and its variations are all based on a corn starch material that is reusable and designed to replace single-use plastics, while Nafigate Cosmetics offers a wide range of products, where there is not much of those containing bioplastics.

Tab. 1 – The overall activity of the companies' communication on YouTube. Source: own research

Company name	Account creation	Total videos	Subscribers
Nafigate Cosmetics	2016	25	45
Nilmore®	-	-	-
Frusack	2018	4	9

Twitter is used only by the company Nilmore®, which does not use YouTube. Even in this case, the number of followers is small.

Tab. 2 – The overall activity of the companies' communication on Twitter. Source: own research

Company name	Account creation	Total tweets	Followers
Nafigate Cosmetics	-	-	-
Nilmore®	2020	54	27
Frusack	-	-	-

Let us return to the videos uploaded to YouTube by Nafigate Cosmetics and Frusack. The typical video of the Nafigate Cosmetics is tuned with violet colour and components or part of the texts and graphics and does not contain any spoken word. The violet-coloured ink spread is typically used on the products and on the company name, which is seen on profile pictures on Facebook and Instagram, but not on YouTube. The first 17 videos were published three years ago, meaning 68 % of all uploaded videos follow the scenario described below; the newer videos, uploaded two years ago and later, are different. The oldest videos consist of the scale of products in the introduction, the selection of a particular product, and then testing that product on a woman or the hand of the presenter, and they end with the product being put back to other products and a hand showing them. The lady is wearing a violet blouse, and if the product has to stay on the skin for several minutes to take effect, it is indicated on the clock by violet colour. These videos do not contain any spoken words, only background music and a short legend with a description of the product and its effect below the video. One of these videos is dedicated to a shower peeling milk with coconut oil and fragrance that contains a natural polymer P3HB, which replaces the function of microplastics, and it is the only one that presents a product that contains bioplastics. Among the new videos that do not show any product with bioplastics, the company reveals cosmetic procedures, in which sometimes a beautician demonstrated the procedures with a customer using Nafigate Cosmetics products, or a sales representative explains the procedures. Another type of video shows a sales representative presenting Christmas packages of products. One video is dedicated to an interview with a beautician about the cooperation with the Nafigate Cosmetics company, its sales representative and satisfaction with the products. In the channel information, the company states its dedication to the development and production of cosmetic products against wrinkles and signs of aging, especially hyaluronic acid and masks made of nanofibers thanks to nanotechnology.

Frusack uploaded all its videos to YouTube 3 years ago. Two newer ones come with the same visual content, but with a slightly different description in the Czech, and English versions. Both videos show shopping with a Frusack instead of a microtene bag. The Czech version begins with "Say goodbye to plastic bags" while the English version starts with "Say hello to Frusack". The videos include information about microtene bag consumption in the Czech Republic (Czech version) and consumption by EU citizens (English version), and both present Frusack as an alternative and best ally in the fight against single-use plastics, a lightweight, transparent and washable bag made in the EU from a unique compostable fabric. The video takes place in

a grocery store, where a man goes for a microtene bag that is freely available in Czech stores, and a woman, who buys fruits and vegetables and puts them in her Frusacks. The Czech description under the video states that the product is based on corn starch. In the English version, the description says that Frusack is a reusable shopping bag for fruits and vegetables to replace single-use plastic bags. The two older videos are quite similar, and provide information not only about the product, but also about the financial path to bring it to market. Both videos are set in Prague, and feature Hana and Tereza, who developed Frusack as a compostable, reusable alternative to replace plastic grocery bags for fruits and vegetables with bioplastic bags made from corn starch. They also inform that Frusack is manufactured in the EU, in the Czech Republic, to support the local economy, and that the company received financial support from a business angel and the European Bank Guarantee. The first video also focuses on the genesis of the idea and the company to solve the environmental problem of microtene bags, which ended with a design product that is not made from petroleum, with production taking place in the Czech Republic to be as sustainable as possible. In addition to the financial support, they also recall the funding campaign and a situation when demand, including international, was higher demand than they could supply. The second video is originally a report on Euronews, which briefly presents the European Investment Fund program as an opportunity for SMEs firms and even startups, using concrete example, the Frusack. It also makes a connection between this alternative solution and the EU Plastic strategy, which states that all plastic packaging must be recyclable by 2030, while the company sees it as a business opportunity, as even supermarket chains need new solutions. In the channel information, Frusack is presented as a sustainable solution for the purchase of fruits, vegetables and pastries.

As for Nilmore<sup>®</sup>'s communication on its Twitter account, several types of tweets can be found. The company not only communicates about its products, as in the two companies mentioned above, but also informs about current environmental issues and tries to raise awareness about the impacts co-caused by the fashion and textile industry. They present their products as sustainable and circular fashion. The majority of tweets in terms of visual style that accompanies the tweets can be divided into several types: a hand holding an object, photos with the founder of the brand, statements about environmental problems, the fashion industry, the company and environmental impact, participation in events such as conferences, lectures, contests, photos of products of the company or showroom and photos related to the campaign Who made my clothes. The problems they point out are carbon footprint, carbon emissions, climate change and climate crisis, water consumption and scarcity, landfilling, biodiversity loss, war, and microplastics, but also issues directly related to marketing practices such as Black Friday or false claims by fast fashion brands about their sustainability, so-called greenwashing. In addition to raising awareness, they provide information on how the company itself is changing fashion to reduce its environmental impact and enhance sustainability through slow and circular fashion. Products are based on recyclable cPLA or cotton materials that can be reprocessed into new fibers and garments. Sustainability is also supported through conscious and responsible management of production and business operations, packaging, transportation, and relationships with employees and suppliers, as well as saving water and reducing CO<sub>2</sub>. The terms sustainability or sustainable are highlighted in less than one-third of tweets (16 x). These terms appear alone as hashtags or in collocations such as sustainable fashion, trends in sustainable and circular fashion, sustainable fashion brands, sustainable e-shop, and sustainable year. Another important terms that appear in the tweets are “circular” or “circularity”. They are used in almost one-fourth of the tweets (13 x), some of them in the form of hashtags, others directly in the text. They tend to be in contexts such as circular clothing, circular fashion, circular pieces, circular materials, circular collection, and circular economy. In its account information,

Nilmore<sup>®</sup> explains that it is changing the way people dress, offering circular clothing and textiles with radically low ecological impact.

The analysis becomes more difficult when it comes to Facebook, which is used by all companies. In the case of Nafigate Cosmetics, it was impossible to scroll down to the first posts and go through them all, so I had to change the procedure by looking in the All Photos and Videos sections. All companies are active on this social media, as shown in Table 3. Frusack, however, has not posted anything since March 2, 2021.

Tab. 3 – The overall activity of the companies' communication on Facebook. Source: own research

Company name	Account creation	Total posts	Followers
Nafigate Cosmetics	2014	> 937	6 411
Nilmore <sup>®</sup>	2021	268	1 163
Frusack	2016	257	11 024

Nafigate Cosmetics not only uses the Facebook profile to promote its products and the company, including enticing and discounted offers for potential customers, but also brings followers some tips, such as how to support physical and mental health, beauty, appearance, complexion in seasons, improve relationships and well-being. The company also provides information about different substances, plants, tests, where to buy and where to find its products. As for the visual style, it has evolved into the uniform style characterised by the violet colour and an ink spread. Although the variety of products is relatively large, there are some products that contain bioplastics. However, the word “bioplastic” appears only twice, but one of them is just an information that the company does not package its products in bioplastics because it does not see any sense in it at the moment, and the second appearance refers to the biopolymer Hydal PHA, produced by the colleagues of Nafigate Corporation, which won the bronze award at the UN contest for sustainable development as the first bioplastic in the endless cycle under the direction of nature. Later, they shared the first biopolymer produced by Nafigate Corporation from used frying oil that naturally degrades in soil and water, and envisioned that this knowledge would soon be used in Nafigate Cosmetics. This has come true, and the company has launched several products that contain bioplastics. These products include coconut peeling milk, coconut peeling soap, sunscreen and acne mask. When presenting the products, the company states that they contain natural polymer (at least 17 x), biopolymer (at least 2 x) or P3HB (at least 16 x). It also points to P3HB as a solution to microplastics in cosmetics, as it performs the same function, but not only removes impurities from the skin but is also naturally degradable, leaving water clean without microplastics. Microplastics as such are mentioned at least 10 x. The coconut peeling milk and sunscreen have a sea turtle illustration on the bottle, which symbolizes that the product is not harmful to them, unlike conventional products which can pose a threat to sea turtles in the form of toxic substances for UV filters and microplastics, as the company states in reference to World Turtle Day. The coconut peeling milk is also described to as a gentle substitute for plastic peelings. The product has also been awarded the Blue Planet for an ecological product that is gentle, removes skin impurities without microplastics and does not burden nature. The company calls its products as gentle cosmetics, but one of the posts states that gentle cosmetics ≠ natural, gentle cosmetics = beneficial to the skin. As for the sustainability of the products and the company's operations, the company once stated on Earth Day that it supports the development of the natural polymer P3HB and the development of gentle alternatives, the orders are packaged in recyclable boxes with fillings made of sustainable materials. Another post mentions that the recyclable chips are made from corn starch. Given this information, it seems that the chips could also be bioplastic. During the coronavirus, the company distributed Nafigo nanofiber masks, also known as N-

Mask. In its profile information, the company introduces itself as a Czech cosmetics company that connects the worlds of cosmetics and science, conducts its research particularly in the field of nanotechnology, and has received a patent for the Nano Eye Lift Mask. The company draws inspiration from natural substances such as hyaluronic acid or extracts from *Bulbine frutescens*. All products are free of perfume and parabens, so they are not harmful to you or the environment. The motto of the company is that you can effectively prevent the signs of aging skin by choosing the right cosmetics.

Although Nilmore® has launched a collection made of cPLA, the term “bioplastic” is not explicitly used, although some terms related to bioplastics are used in 16 posts, biopolymer in one post, and cPLA in 13. Sometimes the material is also referred to as NIPLA. However, they state that cPLA is a material made from renewable resources such as corn or sugar cane. They also have a post about their wash bag that catches the microfibers. The cPLA material was also used by a leading Czech fashion designer, Liběna Rochová, who made her collection from it. Communication on Facebook looks similar to Twitter. The company not only reminds and promotes itself and its products, but tries to raise awareness of environmental issues such as water shortage and consumption, petroleum consumption and unecological production of materials such as polyester, nylon, acrylic and elastane, which are also hardly degradable, ecological footprint, carbon footprint, greenhouse gas emissions, climate crisis, waste, microplastics, as well as socioeconomic problems that the fashion and textile industry and its activities contribute to, including poor working conditions, wages that do not provide a decent living for the people who make our clothes, or greenwashing. On the other hand, they give tips for movies, laundry, fashion and information about the fashion revolution, the Rana Plaza collapse, the side effects of Black Friday or Halloween and remind followers about Earth Day and World Water Day, the HIGG index and many other interesting, surprising, but also disturbing facts. They also showcase contests, events they have participated in, and team members with photos from their childhood. Again, the company communicates the circularity and sustainability of its products and operations. Terms like circular or circularity are used in 86 posts, while terms like sustainable or sustainability appear in 48 posts. When it comes to circularity/circular in the context of other terms, one could see circular clothing, economy, future of fashion industry, system, clothing made from cPLA material, fashion, fashion revolution, products, textile, collection, pieces, cardigan, t-shirts, sweaters, bags, polo shirts, backpack, vests, time for circularity and circularity. The terms sustainable or sustainability appear in the context of fashion, fashion brand, ecological brand, local brand, brand, textile, textile material, long-term, material, truly sustainable product, truly sustainable fashion, wear, festival, ethics, e-shop, shopping, buying, values, development, companies, conference, region, future, H&M collection, and trends. Sometimes there is overlap between the terms such as circular fashion – new trend of sustainability, or trends in a sustainable circular fashion. They stand for the change in fashion, which they love, want to make it differently, more sustainably because of the impact it has. In terms of operations, they point to the water and CO<sub>2</sub> emissions saved by using cPLA in 2021, as well as conscious and responsible approach to production, packaging, transportation, and relationships with employees and suppliers. If the customer no longer wants to use the clothing, he can use several Nilmore® Circular points through which he can return it to the company, which can use the material to make new garments. The company informs that it is working on the development of ecological leather and other new sustainable materials made from cactus, algae and oranges. Nilmore® states that they use carbon neutral packaging made from sugar cane, which means that it is bio-based but can be recycled with conventional plastics. Such a post is accompanied by a video from Braskem. So probably this packaging is also made of bioplastic. The profile information states that Nilmore® is the brand of circular fashion and that it is changing the world of (by) clothing.



Frusack's marketing communication on Facebook is based on the promotion of the product – the shopping bag for fruits and vegetables that is compostable, reusable, lightweight, transparent, breathable, solid, washable and made in the EU. It is dedicated to the replacement of plastics and plastic bags to reduce them, contributing to the solution of the plastic footprint, the plastic waste problem, as well as plastic pollution, which is presented not only as the recognized problem of plastic pollution of the oceans, but also in terms of waste that flows even through the basins of our rivers. However, the problems addressed by the company go beyond the plastic waste itself and the issue of single-use plastics, but are also represented by the poor quality and insufficient durability of the microtene shopping bags, as they are easily perforated even immediately in the shop. The thought arises from the inconvenience of tearing off the bags in the shop or chasing the fruit on the floor when the bag is perforated. Moreover, the product is presented not only as functional and useful but also as what suits you, unlike the traditional microtene bags. With Frusack, you can show that you are not afraid to do more than expected, and that the time for change is right now, and that the snack packaged in Frusack will lift your spirits even in bad weather, and that shopping will be more fun. The company is trying to motivate its followers to make a change, to take their Frusack with them when they shop, even at farmers' markets that are worth visiting and shopping at, because by choosing this responsible option one can support the future, health, the economy, and the environment. The company emphasises that with each purchase we make choices and define values so that we can choose the options that are more local, ethical and better for our health and the health of the planet. The frequently presented mottos or hashtags are “no plastic bags”, “no to plastic bags”, “say no to plastics”, “goodbye plastics”, “sorry plastics”, “sustainability”, etc. It must be said that similar to Nilmore<sup>®</sup>, Frusack company also points out to some other issues and campaigns, such as Overshoot Day, World Oceans Day, Save Food, Stop Single-use plastic, but also other companies with the same vision, e.g. We-Straw, Wrapik. For such companies they had offered a place in their e-shop. The stores where you can find the product are also presented, including the retail chain Albert. Another, less traditional and expected form of buying a Frusack is the Zero hero mat, a vending machine for products that help reduce plastics. At the time of the coronavirus, the company stopped production and released capacities for sewing masks. As for the material itself, it is usually referred to as PLA, compostable knitted fabric, corn starch-based knitted fabric, or corn starch-based fiber, but one may also find the information that it is a plant-based compostable bioplastic. The fabric is woven in Moravia by the company Silk & Progress. The material for Frusack was also used for a compostable parka by Czech fashion designer Mirka Holá. Although the term bioplastic is used only a few times, the company draws attention to the use of single-use bioplastics, because some of them contain additives that are not degradable, and that bioplastics should be used responsibly. Likewise, they respond to the ban on single-use plastics in some countries and the risk that they will be replaced by other single-use products, even those made of paper. The company is trying to draw attention to the vast difference between so-called sustainable and sustainable products that are made locally and ethically produced and not based on petroleum or other non-renewable resources. This can be taken as a warning against greenwashing. As for the visuals, photos typically capture Frusack near the vegetables or fruits, or filled with them, or often with a person. Nevertheless, Frusack informs, that the bags can also be used for pastries and sweets, and gives some tips for food storage. They also remind that Frusack can be a great gift, present new varieties of products and some tempting and discounted offers. The posts often feature the two founders of this company, girls and also the articles and other types of PR. Reading the post, one learns more about the company's development, including financial support from the Hithit crowdfunding campaign, a business angel, and later the European Investment Fund. As for packaging, Frusack comes in recycled paper packaging. In its profile information, the company shares that Frusack bags are reusable for purchasing fruit, vegetables, and baked goods, and that they are made in the Czech

Republic from compostable corn starch-based fibers without harmful additives and under fair conditions for suppliers.

The last social media communication presented in this study is Instagram, as shown in Table 4. As with marketing communications on Facebook, Frusack stopped uploading posts on March 17, 2021, while the other companies are still active. Some posts on this social media are the same as those uploaded by the companies on other media they use. It is pointless to repeat all the information here. However, some differences can be noticed. The companies tend to present at least some of the content in a more visually appealing way, and some of the companies even use this social media for the Advent calendar.

Tab. 4 – The overall activity of the companies’ communication on Instagram. Source: own research

Company name	Account creation	Total posts	Followers
Navigate Cosmetics	2018	498	1 506
Nilmore®	2021	280	1 072
Frusack	2015	423	6 780

Navigate Cosmetics, for example, clearly explains on its Instagram account why it uses an image of a sea turtle for its shower coconut peeling milk. The sea turtle is a representative of the aquatic kingdom, which is most affected by microplastics commonly found in cosmetics that wastewater treatment plants cannot capture. The posts look more visually attractive, there is a typical use of still life, hands and faces with the products, but also flowers and plants, Christmas wrapping paper and gifts, and people or products in nature. They also inform about the Czech Ministry of Environment's campaign called Enough of Plastics, which calls for not replacing conventional plastics with bioplastics in an effort to reduce the consumption of single-use plastics, as they pose a major environmental problem since they cannot be recycled with the conventional ones, but are difficult to distinguish. The company informs that Navigate Corporation focuses not only on cosmetics, but also on research and circular economy, successfully participating in Horizon 2020 and Eurostars projects dealing with the use of waste as a valuable resource for new productions. The company has joined European technology institutions and aims to process oily waste generated in European cities, as well as to develop and apply new materials in electronics thanks to the natural polymer Hydal PHA. Navigate Cosmetics has uploaded advent calendars, where every day a follower could be gifted their products. The profile information presents Czech cosmetics for customers and salons, a high content of active ingredients, a scientific and innovative approach, and a special portfolio for beauticians.

In the case of Nilmore®, many posts on Instagram are the same as on previous media. However, if we look at the number and visualisation style of the uploaded posts on Instagram, we can notice a dominance of grey and beige colour themes, which also corresponds to the colour of their first products launched on the market. However, for the team members, their actual photos are used. They also use text statements such as “without waste”, “without fossil fuels”, “gently to plant”, “this is circular clothing”, “in Nilmore® we are still on a path and we do not want to be at the finish line, every day we want to do things better than yesterday”, “positive change starts with a choice”. Here we may see a similarity with the Frusack company, which also emphasised the importance of a choice. Nilmore® shows recycling on a video and explains, that recycling saves 80% of the energy compared to production from virgin materials. The profile information states that it is the world's first circular clothing brand, a new level of sustainability, and that they are changing the world of (by) clothing.

Frusack presents on Instagram that the bags can also be used for plants and herbs, wild berries, mushrooms or for socks, for example. The company tries to share some ideas for healthy snacks, drinks, picnics, parties, zero-waste paths and upcycling, reminds of some traditional Czech holidays, invites to take Frusack with you on vacations, thanks everyone who uses Frusack and saves the environment, but also makes some competition. The communication looks more personal, even bringing information about the wedding of one of the founders, and the visual style is more adequate to the one used on Instagram, and the posts look more visually appealing. The products are often shown in the form of still life, with more fruits, vegetables, flowers, plants and their parts, and other decorations, different types of underlayments and backgrounds also appear. Few contents are in the form of a text statement like “We want to live in a world where there are more fish than plastic bags in the sea”, “Wrap your food in love, not waste”, “Plastic pandemic”, etc. Plastic pandemic draws attention to the COVID outbreak that has increased the consumption of single-use plastics. However, recycling is still marginal, and although it could be a source of circular economy, oil prices are too low, so they do not motivate manufacturers to replace virgin materials with recycled ones. In this context, the company recalls the consumer approach, which will be more important than ever. One of the last posts is dedicated to the Advent calendar, which contains some inspirations, tips and hacks, but also products and coupons from other Czech ecologically conscious companies, that followers can receive. The profile information presents one-of-a-kind bag for one-of-a-kind planet, reusable shopping bags for fruits and vegetables, made from corn starch fiber, ethically made in Europe, #sorryplasticbags.

## 5 DISCUSSION

This study examines the marketing communication of innovative bioplastic products in social media. Based on the results, I can discuss them and answer the research questions.

*Research question 1: How active are companies in promoting bioplastics on social media?*

In terms of social media activity on different platforms, all companies are most active on Instagram and Facebook. Although the companies actively promote their products, the marketing communication of the products based on or containing bioplastics seems to be precarious. Promotion is done through the profiles, but there are big differences between the companies, which could be due to the product range, but also to the branding and marketing strategy. It is common among all companies, it is very common, that the products containing bioplastics are not called as bioplastics. The term “bioplastic” rarely appears in posts, so one must have some prior knowledge and read in-between the lines to recognise such products. However, some products are more visible, than others. Like Frusack's bags, which are often part of the content posted on social media, or Nafigate's award-winning coconut peeling milk, or the first circular clothing collection made from cPLA by Nilmore<sup>®</sup>, the youngest but very progressive company. Even though all the companies are not very active in communicating their products based on or containing bioplastics compared to the posts they share with their followers, subscribers or other social media users, the products containing bioplastics are shown on their profiles, in the case of Frusack dominantly.

*Research question 2: How are they promoting them on social media?*

As mentioned earlier, companies usually do not use the term bioplastic in their marketing communications on social media. Thus, it is necessary to know what bioplastics are, since companies usually do not directly highlight or refer to the products as bioplastics or products containing bioplastics. The social media user may get the information that the product is made of a new, unique, sustainable, renewable, compostable, circular, degradable or innovative material. Sometimes companies specify the source from which the product is made, such as

corn starch. However, the companies commonly use chemical abbreviations, so a little chemical knowledge is required to understand that the products containing natural polymer PH3B, made from PLA, or cPLA, are in fact bioplastics. Here, one might wonder, if it is intentional for companies not to use the term bioplastic and to promote the products using different denominations, and probably yes. Take Frusack, for example. They combat plastic bags, with “sorry plastics”, “say goodbye to plastics” tags, hashtags like “notoplastics”, etc. with bioplastic bags. However, both Frusack and Nafigate Cosmetics argue that the use of bioplastics must be responsible and that the use of bioplastics in products does not always make sense. All of this could be due to of the problems associated with bioplastics in general, as well as a general lack of communication with the public, concerns about their sustainability, or proper disposal. For example, Aubin et al. (2022) suggested that because the term bioplastic is difficult to use, representing various materials with different properties, it would be better not to use the term itself, especially with non-expert people, which include the public and consumers, but to refer to them as biodegradable plastics or bio-based plastics. In this study, it is clear that companies are using more accurate chemical abbreviations to describe their products.

*Research question 3: Are they promoting them as a sustainable alternative?*

All companies recall current environmental and non-environmental problems and present their specific products to combat these problems because of their characteristics or origin. In this context, they promote them as sustainable alternatives. The issues most frequently mentioned by companies are related to plastic waste and pollution, including microplastics. Nafigate Cosmetics is addressing the problem of microplastics with biodegradable plastic that performs the same function but degrades easily in water. Nilmore<sup>®</sup> could be highlighted as a company that clearly presents itself as a sustainable brand and tries to raise awareness of the current problems, especially in the context of the fashion and textile industry. Nilmore<sup>®</sup> addresses various environmental and socio-economic issues such as waste, landfilling, microplastics, climate crisis, ecological and carbon footprint, emissions, water scarcity, working conditions, etc. by inventing circular products made locally from renewable resources under good working conditions. Frusack mainly addresses the problem of plastic waste and plastic footprint, but also tries to support the local economy by producing an innovative compostable and reusable product for shopping made in the EU, and motivating customers to buy local food and to avoid not only plastic waste but also food waste. All of the above companies have been awarded a sustainability prize or title.

## 6 CONCLUSION

Although the aim of this study was achieved, and the marketing communication of bioplastics in social media was described for the Czech companies that launched certain novel products with bioplastics on the Czech market, several questions arise. These could be answered by further research including in-depth interviews with the founders or other relevant people who manage the companies and their marketing communications. The first question is why the term bioplastic is rarely used in communications and why more information about the issue is not shared with the public and consumers, even though this would be a critique of some of the current materials and their applications, but would raise awareness and debate. The second question is what happened to Frusack, which had become inactive on social media. The third question is why companies do not present themselves as sustainable, not only when it comes to some of their products, but also in their operations or the whole existence and meaning of their existence, for example, by more actively supporting communities, environment and the economy, which could help them improve their CSR, image and reputation, with all the implications that this could have for them.

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# THE NECESSITY OF APPLICATION SMART TECHNOLOGIES AS AN ACTIVE MEASURE AGAINST THE CLIMATE CRISIS

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## Abstract

The aim of the paper is to approach and analyse economic growth in the context of Industry 4.0. We analyse the country's growth, focusing on the development of the gross domestic product (GDP) as one of the most universal indicators. Depending on the type of analysis, we can use the different forms that GDP offers us, such as year-on-year percentage changes or its financial expression, usually in US dollars. We can capture the development of countries even in the distant past, and these figures also help us to predict future developments. At the same time, the evaluation of this indicator is very widespread, and data on the development of GDP are available in the statistics of most countries. Based on the development of GDP, we can provide a relevant picture of the economic situation not only in individual states, but also worldwide. The impact of Industry 4.0 is evident through information and communication technologies that are becoming faster, cheaper and more accessible, which creates space for analysing their use to improve the living, economic and social environment. The results of such an analysis are presented in the SMART 2030 report, where they show that information and communication technologies could play one of the key roles in reducing CO2 emissions. At the end of the post, we can also see this dependence on the graph that shows the development of GDP and the development of temperature fluctuations from 1980 to 2020.

*Keywords: smart technology, Industry 4.0, climate crisis, economic growth*

## 1 INTRODUCTION

The natural disasters that humanity faces are caused by the unsparing consumption of natural resources. Heat waves, floods, tornadoes - these are all weather extremes that occur all over the world and more and more often, also in Central Europe. A few years ago, countries competed to see which country had higher GDP growth. It turns out that continuous high economic growth is not possible and the goals set by the countries appear to be naturally unsustainable. On the contrary, it is necessary to use resources much more efficiently, to reuse them, and instead of profitability to focus on sustainability in the form of minimization of the ecological footprint. This is helped by the application of smart technologies in Industry 4.0, which, instead of the usual monitoring of consumption and evaluation of monthly/ quarterly data, can ad-hoc optimize processes with the aim of maximizing the optimal use of any type of resource.

## 2 THEORETICAL BACKGROUND / LITERATURE REVIEW

Throughout history, mankind has constantly tried to improve its living conditions. In all civilizations, progress has been extremely slow and very often accompanied by unexpected and sudden falls. The most common were natural disasters, epidemics and wars. Today we can estimate that only one fifth of the world's population has a standard of living that we can consider acceptable. This is also why achieving long-term economic growth is currently one of the most frequently asked questions in the world economy. Throughout history, many economists have tried to achieve this state, whose effort was to present themselves with a theory that could thoroughly describe, analyze and quantify this growth. Today we refer to these theories as theories of long-term economic growth. Great progress in this direction comes in



the sixties of the 20th century, when the neoclassical theory of economic growth associated with the names of Solow and Swan was created, which is the first to assume long-term economic growth regardless of the starting point of the economy. When thinking about economic growth, economists use the concept created by Robert Solow (Solow, 1957, pp. 312–320). This theory falls under the neoclassical theories of economic growth and is still often used to explain the sources of economic growth and the performance of the economy.

The basic element of neoclassical growth theory is the aggregate production function, which shows the relationship between inputs and outputs in the economy. It is assumed that economic output is determined by two inputs, which are capital and labor, while how much output will be produced with a given amount of inputs is determined by the state of technology. One of the basic principles from which this theory is based is also the assumption that if we increase the amount of labor and capital in the economy by the same amount, the total output will also increase. At the same time, however, if only one of these inputs would increase (only the number of workers or only the amount of capital), the total product would increase by a smaller amount. From the above, we can define a relationship where the amount of output per worker depends on the amount of available capital. However, there is also technological progress in the function (currently it is technological progress in the time of Industry 4.0) as a growth factor, which Solow calculated as "neutral", which means that it increases the marginal product of both labor and capital equally (Lisý et al., 2016, pp. 382-395).

A comprehensive view of economic growth is also provided by Samuelson and Nordhaus, who write that in macroeconomics, economic growth determines the process by which economies accumulate large amounts of capital (investment facilities), move the barriers of technological knowledge and gradually become more productive. Within a long period of decades and generations, living standards, measured by output per capita or consumption per household, are primarily determined by the aggregate supply and level of productivity of the country.

The factors of economic growth are therefore:

- human resources (job offer, education, skills, discipline, motivation),
  - natural resources (soil, minerals, fuel, environmental quality),
  - capital (factories, machines, roads, intellectual property),
  - technological changes and innovations (science, engineering, management, business).
- (Samuelson & Nordhaus, 2013, pp. 97-103).

#### **The importance of economic growth in the time of Industry 4.0.**

Rapid economic growth is a distinguishing feature of modern times and stands in stark contrast to human history. Examples of how growth affected the situation between countries can also be found in the article by P. M. Romero (Romero, 1994, pp. 3-22), who claimed based on his theory that the growth of per capita income in India is at the level of 1.8% per year. At this rate, income is said to double every 40 years. Between 1975 and 2000, per capita income in China grew at a rate of 6% per year, which means that income growing at this level would double every 12 years. Such a difference in multiplication has a huge effect on the country. In the same span of 40 years, while the Indian economy would manage to double its income with its slower growth rate, China would manage to double its income 3-8 times from its initial value due to its fast growth rate. From 1950 to 2000, per capita income in the United States of America was somewhere between these two extremes, with an average annual growth rate of 2.3%. India, which started at a per capita income level of 7% of that of the US, fell even further between 1950 and 1975. China's rapid growth may have been achieved in large part by allowing businesses to bring in new technologies that were already working in the rest of the world.

Sengupta also mentions the remarkable records of high economic growth achieved by East Asia. From 1965 to 1990, its 23 economies grew faster than all other regions. According to a World Bank study, most of the success is attributed to the apparently miraculous growth of only 8 high-performing Asian economies, which are: Japan, Hong Kong, South Korea, Singapore and Taiwan and the three New Industrialized Countries (NICs) of Southeast Asia: Indonesia, Malaysia and Thailand. Average GDP growth per capita during 1968-1998 was 6.9 in China, 6.7 in Taiwan, 6.6 in South Korea, 6.0 in Singapore, and 4.9 in Indonesia. We can compare these numbers with 2.6% growth in India, 2.0 in Brazil and 0.2 in Argentina. In the last 3 years, the growth rate of China's GDP per capita exceeded 10%, while the United States of America reached less than 4.5% (Sengupta, 2011, pp. 57-70). The pre-analyzed numbers are also confirmed by another World Bank study, which claims that seven percent growth sustained over 25 years was unheard of before the second half of the 20th century. Now this is possible only because the economy is more open and integrated. This allows fast-growing economies to import ideas, technologies and know-how from around the world. One of the sources for this knowledge is foreign direct investment, which has been actively pursued by several high-growth economies, and another is foreign education, which often creates lasting cross-border connections. Sustained high growth is catch-up growth and the world economy is its essential source (The World Bank, 2008, pp. 213-248).

### **3 METHODOLOGY**

Science, as a system of knowledge that is verifiable, explains and further deepens scientific theories, the task of which is primarily their application for practical purposes. In the article, we apply scientific research methods in order to arrive at credible results of the work. The methodology was established with regard to the main goal of the contribution. The first part contains an analysis of the country's growth. We usually focus on the development of gross domestic product (GDP) as one of the most universal indicators. It should be emphasized that due to the topicality of the topic, there is only a minimal amount of literature on this area in the Slovak Republic and it is primarily a search of foreign literature. Thanks to the long history of focusing on GDP, we can detect the development of countries even in the distant past, and these numbers also help us predict future development. At the same time, the assessment of this indicator is very widespread, and GDP development data are available in statistics for most countries. Thus, based on the development of GDP, we can provide a relevant picture of the economic situation not only in individual states, but also worldwide in the given area of our contribution.

The chosen processing methods are based on the specified goals of the contribution. In accordance with the stated goals of the contribution, the following methods and forms are used:

- synergistic processing and analysis of domestic and foreign professional literature,
- classification of the obtained factual material,
- comparison, by which we will compare the state of the solved issue at home and abroad,
- direct research in practice using analysis and interpretation of legal regulations (guidelines/laws) and analysis of available data.

### **4 RESULTS**

"Ecological economics is a trans-disciplinary science that seeks to understand the relationship between human management and its organic and inorganic environment in the context of biophysical growth limits." (Sedlačko & Žúdel, 2007, pp. 184 – 187). One of the first

economists who began to rigorously examine the interaction between economic activity and the natural environment in the light of thermodynamics was Nicholas Georgescu-Roegen. His achievements made him a multiple Nobel Prize nominee and the father of a new and rapidly growing school of economic thought, ecological economics (Mayumi, 2001, pp. 345-371). Nicholas Georgescu-Roegen's work has been used by many, for example Tom Tietenberg (Tietenberg, 2000, pp. 7-11). It is explaining how the first law of thermodynamics applies to a closed and finite system (the Earth), which states that neither matter nor energy can be created or destroyed, only transformed.

Also, the relationship between man and nature is affected by the second law of thermodynamics or entropy, which represents a change to a lower order (primarily at the molecular level) and causes irreversibility. Accordingly, entropy can also be defined as the amount of energy that we can no longer use. The effect of entropy on a closed and finite system (such as the Earth) thus implies that without new energy inputs, the given system will exhaust its energy. Grabdville (Grabdville, 2009, pp. 69-75), who says that the existence of indisputable evidence must be recognized that society (economy) cannot exist without an ecological system, but the environment can exist without society (and economy).

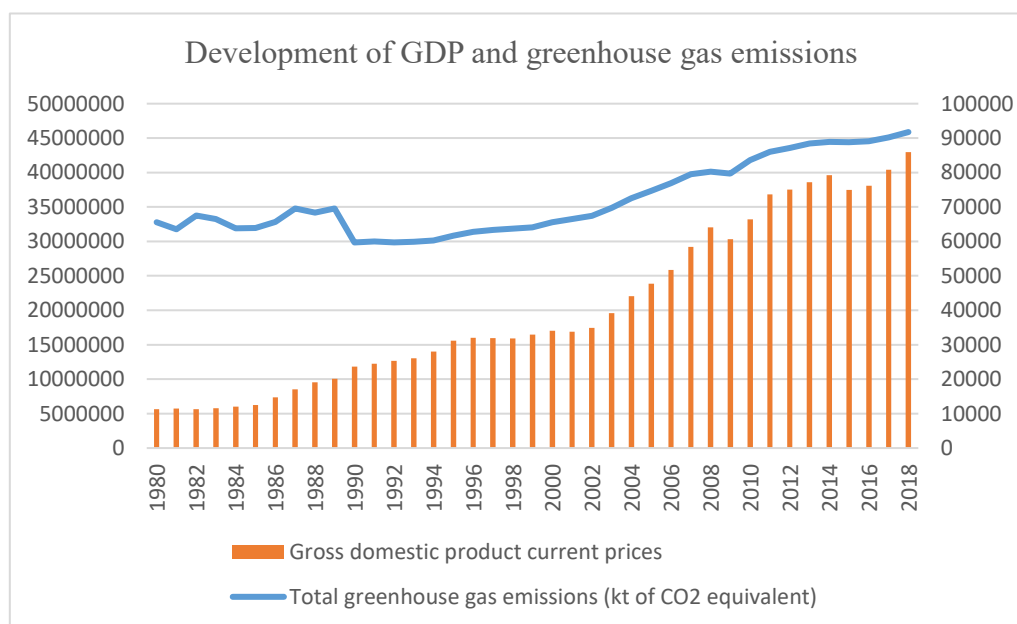


Fig. 1 – Development of GDP and greenhouse gas emissions between years 1980 - 2018. Source: own research

Conventional economics deals only with the human species, forgetting all others, and conventional ecology, on the other hand, studies all animal species except humans. Both cases reveal the limited perspective that prevents an integrated vision of ecological-economic issues. Ecological economics arises without dependence on the discipline, whether on economics or on ecology, on the contrary, as an effort to integrate both. Her view of the world must thus be trans-disciplinary, focusing on the relations between the ecosystem and the economic system in the broadest possible sense (Croix, 2004, pp. 37-52). The three independent goals of ecological economics are: sustainable scale, adequate distribution, and efficient allocation. To achieve them, it is necessary to look at the world in a trans-disciplinary way and it requires the integration of several elements.

Ecological economics arose because hundreds of years of specialized scientific research left the world unable to understand or manage the interactions between humans and the environmental components of the planet (Caballero, 2005, pp. 313-341). At the same time, it is noteworthy that the success of the Industrial Revolution 4 has dramatically reduced the scarcity of consumer

goods for most of the world's population. Accompanying economic growth, however, now threatens the previous abundance of natural goods and services on which we fully depend. These have now become new scarce resources, and humanity must reshape our economic system and deal with the emerging reality (Dujava, 2010, pp. 74-79). The perspective of ecological economics is that there is a maximum sustainable scale of the economic system with respect to the ecosystem. This range is determined by comparing the economic benefits with the marginal environmental costs – similar to the equilibrium in a business. Depreciation of natural assets (natural capital) is real in driving the economy and cannot be ignored. This means that the ecological costs of alternative opportunities arise that the ecological costs of alternative opportunities arise. If we want to analyze the growth of a country, we usually focus on the development of the gross domestic product (GDP) as one of the most universal indicators.

Depending on the type of analysis, we can use the different forms that GDP offers us, such as year-on-year percentage changes or its financial expression, usually in US dollars. Thanks to the long history of focusing on GDP, we can detect the development of countries even in the distant past, and these numbers also help us predict future development.

At the same time, the assessment of this indicator is very widespread, and GDP development data are available in statistics for most countries. Thus, based on the development of GDP, we can provide a relevant picture of the economic situation not only in individual states, but also worldwide (Mlynarovič & Mit'ková, 2010, pp. 27-34).

When analyzing this dependence, we did not focus on the total GDP because we also investigated differences in different parts of the world. We compared 7 regions (North America, Latin America and the Caribbean, Europe and Central Asia, East Asia and the Pacific, South Asia, the Middle East and North Africa and Sub-Saharan Africa) as well as data for the entire world. The results confirm to us that the more advanced the economy is (the higher GDP per capita the country achieves), the more CO2 emissions it produces. At the same time, we also noticed large deviations between individual regions. The region of North America in particular is very far from other parts of the world and is characterized by the fact that it reaches very high values of GDP per capita, but at the same time very high values of CO2 production per capita. On the other hand, we are looking at extreme values for the region of Sub-Saharan Africa, which is characterized by very low GDP values, but at the same time very low values of CO2 emissions.

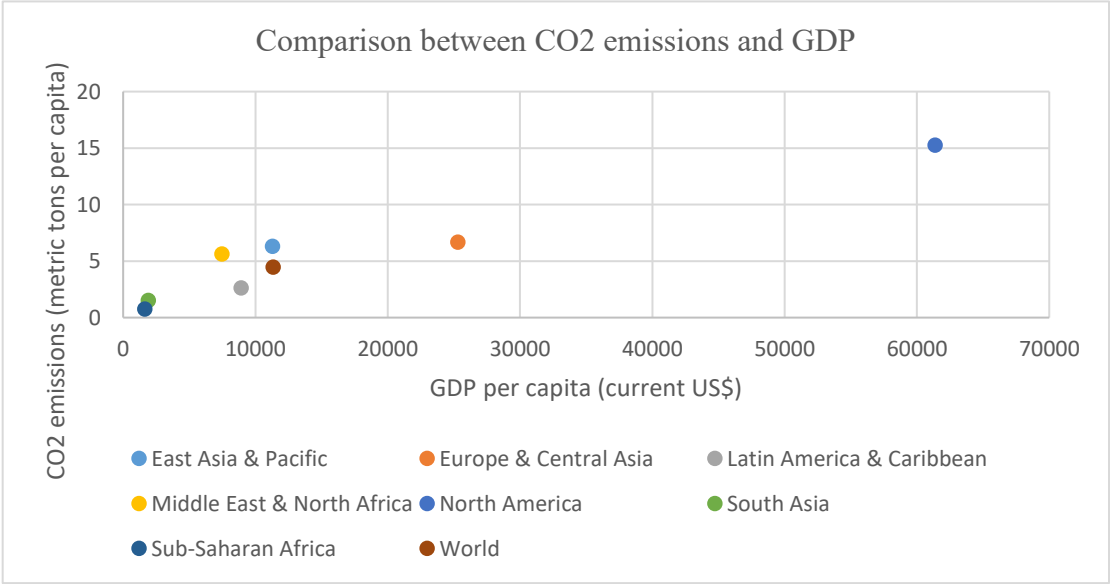


Fig. 2 – Comparison between CO2 emissions and GDP per capita in regions of the world. Source: own research

## 5 DISCUSSION

Information and communication technologies are becoming faster, cheaper and more accessible, which creates space for the analysis of their use to improve the living, economic and social environment. The results of such an analysis are shown in the SMART 2030 report, where they show that information and communication technologies could play one of the key roles in reducing CO2 emissions, which could be achieved by 20% by 2030 and keep them at the 2015 level. In the field of agriculture, information and communication technologies could lead to an increase in yields of agricultural crops by up to 30%, saving up to 300 billion liters of water and 25 billion barrels of oil per year. Economically, they could bring in annual revenues of up to \$11 billion by 2030, and could also contribute to easier access to the "knowledge economy," which means more affordable healthcare and e-learning tools.

According to the World Fund for Nature, we can define nature-based solutions as interventions to protect, manage or restore ecosystems that are purposefully planned to provide measurable positive benefits in the area of climate change adaptation or mitigation. These are subsequently beneficial for the development of society and biodiversity in managing anticipated climatic risks for nature, which can undermine its long-term effectiveness (WWF). Nature-based solutions for climate change use the power of nature to reduce greenhouse gas emissions and also help us adapt to the impacts of climate change. They are win-win solutions that involve conservation, restoration and sustainable ecosystem management to address societal challenges and promote human well-being. Forests are probably the most well-known nature-based solutions to climate change, but there are many more – including peatlands, mangroves, wetlands, savannahs, coral reefs and other landscapes (WWF).

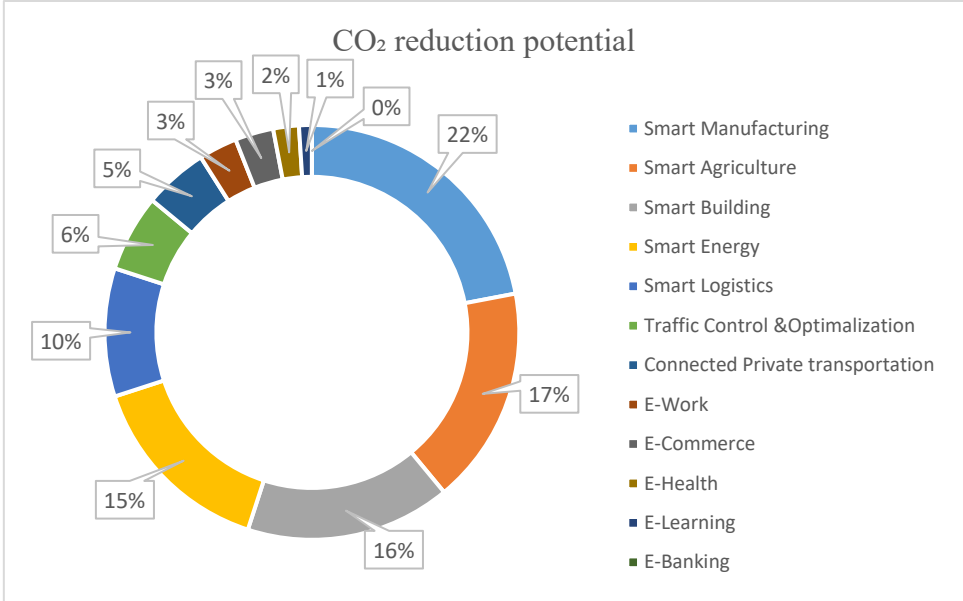


Fig. 3 – CO2 reduction potential according to the area of application. Source: own research

Principles of nature-oriented solutions: 1. adopt the standards (and principles) of nature protection; 2. they can be implemented independently or in an integrated way with other solutions to social challenges (e.g. technological and engineering solutions); 3. are determined by the natural and cultural contexts specific to the location, which include traditional, local and scientific knowledge; 4. create societal benefits in a fair and impartial manner, in a manner that promotes transparency and broad participation; 5. preserve biological and cultural diversity and the ability of ecosystems to evolve over time; 6. are applied on a national scale; 7. recognize and deal with the trade-offs between the production of a few immediate economic benefits for development and the future production possibilities of the whole range of ecosystem services;

a 8. are an integral part of the overall design of policies and measures or activities to address a specific challenge Oxford University's Nature-Based Solutions Evidence Platform analyzed case studies that dealt with nature-based solutions and investigated their effect on various climate change issues. Most studies were devoted to reduced water availability (86), the problem of soil erosion (81), loss of wood production (47) and loss of food production (43). These 43 case studies focusing on the loss of food production were published in 36 scientific journals.

## 6 CONCLUSION

Within the framework of industrial growth, it is important to monitor the connections between the development of global GDP per capita, between the development of global temperature and greenhouse gas emissions (Sardadvar, 2011, pp. 48-56). We can assume that the increase in GDP and thus the development of the economy contributed to the increased production of greenhouse gases, which supports global warming on our planet. We can also see this dependence in the graph below, which shows the development of GDP and the development of temperature fluctuations from 1980 to 2020.

As we defined in the post, the increase in global temperature (it is not the only factor, but one of the main ones) results in several problems. They are, for example, the melting of glaciers, rising ocean levels, extreme weather fluctuations, which in turn lead to various other socio-economic problems such as food shortages and poverty. For a more detailed view of the situation, we divided the world into 8 regions, between which we also looked for connections in terms of GDP per capita and the amount of CO<sub>2</sub> produced per capita.

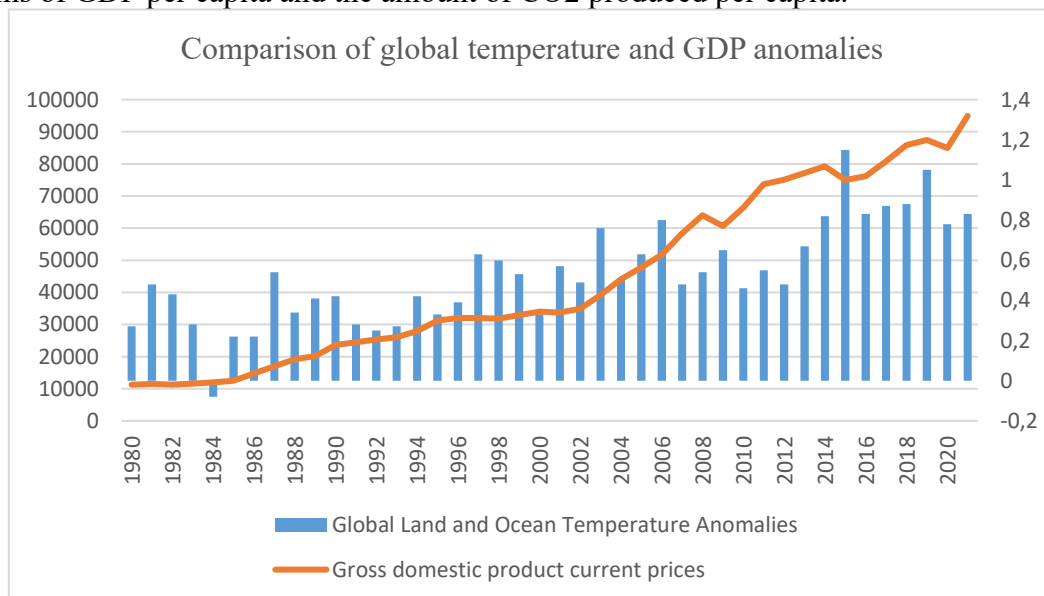


Fig. 4 – Comparison of global temperature and GDP anomalies. Source: own research

This analysis showed that the higher the GDP a given country achieves, the more CO<sub>2</sub> it emits into the air, and conversely, developing areas that achieve low GDP also show low values of CO<sub>2</sub> emissions. The data we obtained from the World Bank studies also confirm our previous results on the relationship between GDP and greenhouse gas emissions. Despite the fact that we have identified in the previous graphs that countries with lower GDP per capita produce less CO<sub>2</sub> into the air, we cannot assume that they also have cleaner air. Clean air is also one of the important factors when analyzing the development of countries, and the analysis showed that countries that produce less CO<sub>2</sub> show more polluted air than developed countries. Slovak manufacturing companies must also carefully monitor changes in the market and respond to the

demands of domestic and international markets. In particular, they must consider meeting the conditions of foreign markets, because Slovakia is largely dependent on the export of products (Gubová & Richnák, 2016, pp. 18-21). It should be noted that this is a modern and intelligent technology.

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# DIFFERENCES BETWEEN SPORT AND ESPORT TEAM MANAGEMENT

*Peter Seidner, Oskar Karlik*

## **Abstract**

There has been a lot of debate on the topic of esports and whether it can be counted as a sport, and rightfully so. There are a lot of similarities between the two, especially within the pro scene. Teams trying to win tournaments in order to prove that they are the best and practicing their hardest to lead their team to victory. Players being traded and paid high salaries in order to join a team and perform. Athletes becoming famous and having fans that they have to please. These similarities also come with differences and in this article we look into how teams are being managed in both, sports and esports, and we look for key similarities and differences. We identified several key parameters that are different and hence influence the managerial style and approach organizations need to take when they want to be a part of sports or esports industry.

*Keywords: sport, esports, management, team, coaching*

## **1 INTRODUCTION**

Sport is one of the most popular recreational activities, for centuries being an important element of society. Over the recent decade, however, esports (electronic sports) became extremely popular, even beating numerous popular sports in viewership. The goal of professional teams, however, stays the same, compete at the highest possible level and bring home victory. Many esports, similarly to traditional sports are team based while others are individual. Professional teams in esports are fast growing to the size of their sport counter parts. One team can easily spread over numerous esports and categories of games, with many different staff members, coaches, and managers. Where traditional sport teams are tasked with focusing only on one sport, e.g. football or basketball, esports teams are split into several smaller teams with one overlapping entity, e.g. Team Liquid is a popular professional American team with teams playing on the top level of games like League of Legends, Valorant, Dota 2, and Starcraft 2 amongst others. In this case teams like Team Liquid serve as an organization of teams all belonging to the same brand/club. Meanwhile traditional sports take care of their main team with potentially a B and C team as well as an academy for younger/upcoming players.

All these organizations and team clusters have day to day operations, managerial tasks and challenges that they have to deal with, and they are all connected to management. In this article we will go over the necessary literature and compare the managerial nuances of managing sports and esports teams. We will compare the main differences in the structure if these teams, their challenges and the different approaches the trainers and managers take in order to train their athletes and bring their teams victory. In addition, we will identify if there are any different problems that sports and esports teams/managers are tackling that the other side does not have to deal with.

## **2 LITERATURE REVIEW**

Sports and esports are both highly competitive and similar in nature. There has been numerous articles and researchers trying to definitively decide if esports are sports or not. More often than not, the aspect of missing physicality in esports is the deciding factor in these discussions such

as by Parry in 2018. Whether or not esports can be classified as a sport is, however, not a concern here. There are substantial differences and similarities between the two industries but the main goal of these organizations are the same: Make profit by taking their teams to victory by managing the teams and the individual athletes and leading them the top of their potential. In order to do this the teams need to be managed and coached. These managers have objectives that they are trying to pursue with their teams which were identified by Bader Sabtan, Shi Cao, and Naomi Paul in 2022 for esports. Here numerous coaches of popular esports teams were interviewed in order to find out the actual goals and tasks of these teams managers. In addition, further roles within these teams were established by Matthew Watson, Callum Abbott, Ismael Pedraza-Ramirez such as psychologists, scouts, health managers etc.. Moreover, roles within teams are also defined further by Geoff Musick and others where especially the leadership role within the team is defined. They also defined different communication strategies, and mental processes used within these professional teams. Other challenges that differ from traditional sports were defined by Oksana Shynkaruk in 2021. She also mentions a need for more specialized personnel needed in the esports team as not all managers and coaches are qualified for the work within the industry, or specific teams. Freeman Guo and Wohn Donghee Yvette then further specify the team coordination aspect within esports teams by comparing different theories of team management and coordination.

On the other hand we have traditional sports where the management and coaching methods and challenges might seem much more common/relatable. Liz Masen in 2021 collected a survey of coaches being asked about top challenges they face in this age's team management. Characteristics of best coaches and time management issues were also surveyed. Since traditional sports as a field had much more time to develop, there are numerous theories of how a team should be managed from theoretical perspective. One such theory is brought forth by Marko Trnini in 2009 who suggest the use of dynamic systems theory and also points out the multi-dimensional development path an athlete should take. Another such article by Peter Dawson in 2000 discusses the efficiency of coaching techniques applied in football specifically and their effectivity. However, similar to esports, traditional sports also have variety of staff that is responsible for the teams condition and performance. The connection and possible challenges of the teams staff is best described by Fabian Otte in 2020. Lastly the focus and goals that the coaches and teams are trying to achieve are best summarized by Heleen Van Mierlo in 2020.

### **3 SPORT TEAM MANAGEMENT**

“For the competitive sports, the ultimate goal of sports training is to create outstanding athletic performance; the reasonable arrangement for the exercise load of athletes is the basic and controllable factor to improve the athletic performance of athletes.” (Peng, 2010) Athletes train, day after day in order to better themselves and their teams for one simple goal, victory. Victory for themselves, victory for their team and organization, and at the highest level, the Olympic games, victory for their country. Coaches and managers are the part of sport organizations that is responsible to bring these dreams into a reality. There are a plethora of factors influencing performance of athletes and most of them, if not all, can be influenced by coaches and managers. Among others, team coaches are responsible for scheduling and planning practice for the teams and the individuals within those teams. They are responsible for the athletes environment, gear quality, meal plans, rehabilitation, and their general schedule. Furthermore, coaches should offer advice towards techniques and lifestyle, assess risks and do general analyses of their athletes as well as the opposing teams, and apply for funding. (Indeed, 2021)

Thus the chances of achieving victory depends on many factors, most important of which is the performance of the athletes within a team. “Therefore, the key problem is distinguishing the different physical (or other factors) athlete and the different stage of training, or study the application of various training theories.” (Peng 2010) Coaches have to work with their athletes in order to bring out the most performance from them. Peng also argues that an analyses system should be used in order to organize the performance data overtime and have an easier time spotting patterns in increased or decreased performance. “The entire sports preparation is a transformation process, which primarily has to be based on the determined genetic potential, the athlete’s preparedness state, the evaluation of the athlete’s actual quality and recognition of his weak and strong sides.” (Trninic, 2009) These are all qualities that the coaches and managers need to recognize and help nurture.

In addition to such system, it is also argued that specialists should be brought onboard and work in conjunction in order to have the highest performance increase and team success. “This type of organisational design for support staff in high-performance sports organisations could empower specialist coaches to contribute meaningfully to individual athlete development and preparation for performance, without feeling marginalised.” (Otte, 2020) Specialist coaches such as a coach for team practice, individual performance, rehabilitation, stamina, mental strength, etc..” That is why the theory of the athlete’s multi-dimensional development is multi-directional and primarily based on transforming his polyvalent dispositions. This is also evident in encouraging the development of the ability to play multiple positions in a sports game.” (Trninic, 2009) Even within a team, individual ‘special’ training is needed. “Extending individual achievement goal theory, results demonstrated that teams scored more game points across the competitive season to the extent these teams were more approach oriented and less avoidance oriented in terms of both mastery and performance.” (Van Mierlo, 2020) This individual performance ultimately helps the entire team to perform better.

There are numerous theories and methodologies of how one should run and manage a sports team. “According to the stated facts, in the model of managing the development of top-level athletes in team sports, it is crucial to use methodology of integrated approach to athlete’s preparation to optimize the development of potential and player’s actual quality.” (Trninic, 2009) Trnic also argues that managing the development of top-level athletes is a complex and dynamic process that asks for the application of dynamic systems theory in order to achieve effectivity.

A sports team manager also has to deal with numerous issues that are not always connected to the performance of the team or individual athletes. Managers need to also focus on viewers, organizations outside of their own, the team (outside of the athletes, e.g. psychologist, medical staff, etc.) as well as previously mentioned sponsors. This means that coaches not only micromanage the team and athletes, they also have to macro-manage the organization. “Operative management of sports teams is an important part of sports management which has direct implication on the product materialized in the results of a sports team in professional competitions.” (Mangra, 2015) However, sponsorship, budgets and wages have a huge impact on an athletes performance: “It has also been found that coaching efficiency estimates are little affected by alternative measures of team performance but are highly sensitive to ex post financial expenditures of playing talent such as wage expenditure. Ex ante measures of playing talent based on player characteristics or predicted transfer values are recommended on both theoretical and empirical grounds”. (Dawson, 2000) Here we can see that sponsorships and budget are not only affecting the teams training, mentality, and preparation but also the amount of talent the team is comprised of. Bigger budget means that the team manager can hire a more promising, more expensive, player to be a part of the team that otherwise might be underperforming. Same logic applies towards hiring a more qualified/performing staff. The

industry as a whole is currently being challenged by the new generation. Team managers are being task with retaining and obtaining views, fans, and sponsors, however, the industry is struggling with technological integration. “Many fans connect with their favorite teams through social media, which puts pressure on teams to constantly keep updating their Facebook timelines and Twitter feeds. Likewise, venues must also keep up with the pace.” (Sports Management Degree, 2022) Thus the team/organization managers need to manage not only their athletes and their progress but also their social media interactions, posts, and also organize online events that would please the fans. Hence arises one of the biggest challenges in current sport, how to captivate the younger audience that is more interested in esports it seems.

#### **4 ESPORT TEAM MANAGEMENT**

Esports are a “Competitive gaming at a professional level and in an organized format (a tournament or league) with a specific goal (i.e., winning a champion title or prize money), and a clear distinction between players and teams that are competing against each other.” (Newzoo, 2020) Newzoo is a company that specialized on gathering and analysing esports data. They also predict that by 2023 the number of esports viewers globally will grow to 646 million. This following is larger than the estimated following of basketball which belongs to the top 10 sports worldwide when it comes to viewership. From this information is it clear that esports are extremely popular and on par with, if not even more, traditional sports are right now. As such, esports teams and organizations are rapidly developing and growing together with the industry.

Players who used to be outcasts and shut-ins a decade ago are now being called, and treated as, professional athletes. This shift in the industry, together with its youth, means that there are not enough seasoned professional when it comes to managing and coaching as one would expect to find in traditional sports. This means that the athletes are evolving and growing their organizations as they mature themselves as players, and people, which may result in conflict and mismanagement of the team. Since esports its almost exclusively a youth sport a lot of conflict may occur from individuals personality rather than the team dynamic: “Possible reasons can be that participants only considered self-motivated personal actions ‘team coordination.’ Therefore, coordination mechanics that were built in gaming systems did not count; or that those mechanics had been seamlessly embedded in their teamwork and became a natural/invisible part of their gaming experience. Therefore, our participants’ neglect of these built-in game features raises interesting questions regarding how eSports players perceive and understand the meaning and significance of cooperative communication mechanics to their subjective gameplay experiences.” (Freeman, 2019) There is also not an established method that would serve as the main way that team members and athletes for the team are selected. “The selection criteria for potential team members are not standardized but dynamic; the weight on each criterion also varies across different users.” (Freeman, 2019) In general, the communication and teamwork part of the esports industry provides a lot of opportunity for research. “With regards to teamwork, professional esports provide an opportunity for researchers to better understand how practiced and high-performing teams collaborate using a multitude of resources such as practice facilities, coaches, and planning sessions. While on the other hand, casual esports players offer an opportunity to better understand impromptu teaming and how common ground can be established quickly within a virtual world. Recent decades of research” (Musick, 2021)

Although “The industry is plagued by players retiring young” it still struggles with team dynamic towards coaches and trainers. (Uusitalo, 2021) Young players are having problems with respect and obedience when it comes to coaches that are roughly their own age with similar amount (or sometimes less) experience. “In traditional sports, players are often coached,

trained, and selected from an early age; however, Esports players usually play on their own without any coaches until they join a professional team. Players' trust in coaches and the acceptance of coaching methods are issues in Esports." (Sabtan, 2022) In addition to this, even the coaches themselves agree that currently there is no common practice of establishing which coach has the most potential and should be hired. Unlike in traditional sports, even the team players' opinion of the future coach is sometimes taken into account, not just the top managements'. "Most of the coaches agreed that there was no single best practice to evaluate and recruit a coach. Sometimes the team's top management asks for players' feedback after having a specific coach for a time. Most coaches' activities take place behind the scenes, and it is very difficult to assess a coach's impact on a team. Currently, there is no defined career path for someone to become a coach. Ideally, a coach should be a professional player first then transition into coaching. Still, due to the relatively new scene, there are not enough professional players who have retired and transitioned to coaches. An experienced player transitioning into coaching will have excellent game knowledge and earn the player's respect relatively easily. Some coaches currently suffer from players not respecting their opinions due to the coach not being mechanically skilled in the game." (Sabtan, 2022)

"There is an extreme personnel shortage in the native multicomponent eSports segment in the eSports industry: managers, broadcast organizers, psychologists and commentators. Highly qualified referees, coaches, organizers of competitions, developers of computer games remain the most demanded specialists nowadays. To be able to perform professional functions at a high level, everyone has to have a clear understanding of the game and the peculiarities of team organization, as well as have a gamer's experience." (Shynkaruk, 2021) Some organizations are even trying to convert the professionals from traditional sport environment to the esports one. "The significant role of the coach is recognized, in particular, in team-tactical games. Therefore, it is possible to extend their long-term experience in training coaches in various sports to expand the accumulated theoretical knowledge and practical skills to solve the problem of preparing highly qualified coaches in eSports." (Shynkaruk, 2021) Therefore esports organizations are aiming to mimic the structure of traditional sports teams (not counting the IT specific parts). Similar to traditional sports, esports organizations employ a head coach, assistant coach, an analyst, a provisional coach, psychologists, and scouts. These position are self-explanatory and almost identical to their traditional sports counterpart. The main difference here is the expertise and the knowledge needed in order to fill these roles.

Numerous coaches of League of Legends (one of the largest esport titles) teams were interviewed and agreed on the following 5 objectives of a coach in esports:

- identifying the players' potential and create winning conditions for the team
- developing synergy and trust within the team
- developing the micro and macro play of the team
- setting goals to continuously improve the players
- motivating the players to improve and maintain peak performance. (Sabtan, 2022)

These all seem like they would be applicable to traditional sports as well, however, we were able to find 2 big challenges that esports coaches have to deal with on a day to day basis that traditional sport team do not have/are not able to deal with. Speed with which the games keep changing and the long hours going into practice.

Unlike sports, esport titles are a company property, hence they can be changed at any point with teams having little say over the changes. "The esports industry's development requires constant technological improvement, which has induced in gamers a growing demand for increasing

virtual reality, higher speed, and game complexity.” (Saiz-Alvarez, 2021) Most games operate in cycles of 2-6 weeks after which the next patch comes to the game which may bring little, or huge change. Looking at the example of League of Legends, the game is patched biweekly, bringing changes known as buffs (improvements) and nerfs (deterioration) to in-game items, playable champions, and sometimes also environmental changes such as map changes or monster changes. In addition, approximately once a year, when the ranked season is over, the game tends to deliver larger changes that have a huge impact on the professional play and the season coming next. League of legends, being the giant in the industry it is, serves as a benchmark to which other games tend to be compared. All this serves to illustrate that athletes and coaches have to constantly keep changing their approach to the game. Strategies keep to constantly changing and the flow of the game never stays the same for too long. Coaches have to be as versed in the game as their athletes are in order to keep up and be able to devise strategies based in the current ‘meta’ and their teams capabilities. “In this way, an esports leader has the capability to help sculpt the team into having a mental model that resembles their own. This approach, which occurs through discussions both in and out of game, has the potential to develop a team with a highly similar shared mental model. However, this shared model could be limited if the leader’s mental model of the task and team are inaccurate” (Musick, 2021)

Lastly, the amount of practice going into an esports team is largely surpassing the amount of practice put into traditional sports. “The coaching staff struggle to keep the players motivated, which leads to players sometimes not taking scrims seriously. This is common among most teams, perhaps because of the long working hours, as it is difficult for a player to stay focused when they practice for 12 h a day, six days a week. Additionally, the game does not have any practice tools for teams to train on a specific phase in the game or under specific scenarios. As a result, if a team wants to practice a team fight when all players’ characters are at the max level, they will have to play through all the previous phases of the game to level up and reach the maximum level before practicing the real deal.” (Sabtan, 2022) In addition after all this practice many players tend to keep playing the game at home for individual practice. “Players face many mental stresses, with social stress seeming to be the most dominant.” (Sabtan, 2022) This is due to players often streaming on Twitch.tv for additional income and exposure for their team as well as keeping up almost constant social presence for their fans. This all creates a lot of stress on a young mind that only comes in small doses for the traditional athlete. Hence there is a large emphasis on the field of psychology when it come to esports research. “A sport psychologist and performance coach should work in a parallel and complementary fashion in order to provide optimal and ethical support to an esports team. Both roles and the division of labour between them must be clearly explained to players and staff in order to avoid potential confusion or conflicts of interest.” (Watson, 2021)

## **5 DISCUSSION**

Based on the previous research it seems that traditional esports and sports management have a lot in common. Seeing the 5 key objectives of an esports coach we can objectively state that they also apply to traditional sports. Furthermore the non team related objectives, such as funding, looking for sponsors, gear management, and team management seem to be applicable to both sides as well. The key differences lay within the biggest challenges in both categories.

Traditional sports see little change over a long period in time and these changes rarely influence strategy of the competing teams. Coaches, although trying to devise new strategies to beat their opponents, ultimately only form minimal change within their sport, if any compared to esports where a good strategy can be ‘meta’ changing. Thusly we can conclude that one of the biggest current challenges of sports is innovation, particularly when it comes to the digital media. This

goes hand in hand with the previously mentioned lack of engagement with the younger audiences. “According to the statements of the IOC on several occasions, the reasons that they want to put esports in the roster is to bring in younger audiences to watch the Olympics and to get them interested in the traditional sports as well.” (Seidner, 2022) Even the Olympic committee is exploring esports in order to expose younger audiences to traditional sports. Consequentially, team coaches and managers need to explore new strategies in order to gather larger audience for their team and athletes. This task has become even more substantial during the recent Covid-19 pandemic when audiences were not able to attend games in such large numbers and fans had to mostly engage with their favourite teams and players online.

This area is not one where esports struggle. However, one could argue that esports teams and athletes suffer from overexposure to the social media. Players are constantly watched online during streaming sessions, recognized in games with their non-professional counterparts, and required to keep up their social media in order to expose themselves even more. This creates a lot of stress for the players and acts as an additional pressure for the athletes to perform. Thus coaches need to be able to moderate this exposure for their athletes in a professional fashion and also help them deal with the extra pressure from social media.

The next differentiating challenge that management has to deal in esports is the long working hours. “The long practice duration makes it difficult for the coaches to keep the players motivated. Players face many mental stresses, with social stress seeming to be the most dominant.” (Sabtan, 2022) we previously mentioned that the physical aspect between sports and esports is completely different. Where sports put pressure on the body in a form of deconstructing and reconstructing muscle, esports put pressure on the body in terms of long hour sitting sessions, constant wrist movements, complete mental focus on the screen in front of them, etc.. Where a tennis player has a break of 10-30 seconds between points, a professional esports athletes gets to take a break in between 30-60 minute matches or they have a mini break of 5-30 seconds between their deaths in-game which occur on average 3-5 times in a game. With this amount of focus players practise for 12 hours straight and then they come home and practice some more on their own. Where the physical body places limits on the amount of hours a traditional athlete can train, this limit is hugely extended by the way esports are designed and can be practiced. Therefore, in esports, coaches and managers struggle to keep their players motivated during practice sessions.

## **6 CONCLUSION**

The presented research shows that sports and esports team management is actually fairly similar, especially when it comes to basics. Both sides strive for victory and go about it by pushing their athletes further, both individually, and as a team. In addition, team managers also have to deal with other members of the staff, gear, sponsors, etc., and that is also true for both sides. It is clear that the basics are similar in tasks, and structure. The differences in management challenges, however, come where the two parts of the sports industry don't meet, namely electronics. On one hand, traditional sports suffer from having to bring the tradition to the new age of digitalization which is creating further stress on athletes and coaches. On the other hand, in esports athletes suffer from almost overexposure to the new digital media. They are constantly online and being watched through different media and by different people from fans to scouts almost all day long, everyday. Furthermore since the taxation on the physical body is of a different kind than its traditional sports counterpart, practice takes several times longer and easily reaches 12 hours a day in the professional teams. This then created a problem with motivation and extra mental stress that the managers have to deal with. Overall it is up to the team's manager to create a plan/model of how to deal with these issues and it proves to be an

individual approach as in both sports and esports there is no one metric to evaluate a coach and no one proven way to manage a team.

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# THE EFFECTS OF USING PMSS ON ORGANIZATIONAL PERFORMANCE IN PUBLIC AND MANUFACTURING SECTOR: AN OVERVIEW

*Peter Sekáč*

## **Abstract**

In today's dynamic business environment, organizations are under enormous pressure and must constantly improve their performance and competitive advantages in order to be sustainable and prosperous. To achieve business excellence, companies implement sophisticated performance management systems for the purpose of fulfilling strategic goals, collecting and evaluating data intended for monitoring and improving organizational performance on a regular basis. This paper summarizes the results of available empirical studies presenting the diverse effects of using PMSs on organizational performance in selected sectors of the economy: in public and manufacturing sector. Recent empirical research provides rather mixed findings regarding the effects of using PMSs on organizational performance although studies with evidence of positive effects predominate in public and manufacturing sector. Only peer-reviewed articles with release dates from 2011 to 2022 from the databases Web of Science and Scopus were used for the purposes of this overview.

*Keywords:* manufacturing sector, organizational performance, performance measurement, performance measurement system, public sector

## **1 INTRODUCTION**

In the late 1980s, the professionals and scientists began to point out that historical financial data alone is not sufficient to demonstrate comprehensive performance measure due to the increasing complexity of organizations and markets. Financial reporting alone does not fully reflect the true market and shareholder value (Striteska & Spickova, 2012).

Around the same period, many approaches and procedures have been introduced in the design and implementation of performance measurement systems (PMSs), which are constantly evolving and adapting to changing conditions over time. Traditional PMSs have been subject to criticism for their inadequacy and incompleteness against the new, turbulent conditions of the market environment due to their past and short-term orientation, not considering the intangible aspects of business (Janjić, et al., 2015) and due to a weak connection with organizational strategies (Owais & Kiss, 2020). In a modern concept, PMSs are expanded in order to enable sustainable development - not only economic prosperity is monitored, but also the quality of the environment and social equality (concept of corporate social responsibility – CSR) (Bellassen et al., 2022). The result are PMSs based on the monitoring of all 3 mentioned parameters, i.e. economic, environmental and social performance, due to which financial and non-financial performance are addressed equally (Owais & Kiss, 2020; Mio et al., 2022).

Despite the fact that there is a significant number of implemented PMSs in practice conditions and the topic is very prevalent in the available academic literature, there are still gaps and contradictions in the research of specific aspects of PMSs' effects on organizational performance. In this context, the aim of the paper is to summarize selected recent empirical findings regarding the various effects of using PMSs on organizational performance in selected sectors of the economy: in public and manufacturing sector.

The paper is structured as follows. The introductory part is followed by a Literature review, where attention is focused on the definition of basic notions and the issue of PMSs and their impact on organizational performance in general. Next part is the methodological part. The Results section summarizes the most recent empirical results of studies on the effects of PMSs on organizational performance in the public and manufacturing sector. Finally, last section concludes the paper and suggests further research.

## **2 LITERATURE REVIEW**

Organizational performance is a broad concept in terms of definition. In the existing understanding of the concept of economic, social and environmental performance, the terms organizational performance and organizational effectiveness may be used interchangeably, because in connection with organizational performance, effectiveness (fulfillment of goals), efficiency (optimal use of resources), employee and customer satisfaction, innovation, quality of products and services, etc. are generally assessed (Kumar, 2019; Rozsa, Z., & Machova; Mura & Hajduová, 2021; Virglerova et al., 2021).

A PMS includes a set of procedures and indicators (financial and non-financial) that accurately and continuously measure the performance of activities, processes and the entire organization and it is a crucial aspect in managing companies (Varisco et al., 2018). According to Franco-Santos et al. (2007), PMSs cover 3 essential processes: "information provision", "measure design and selection" and "data capture". The essence of performance measurement is the quantification of organizational efficiency at the level of business processes and activities performed by people, enabling timely involvement of decision-making processes (Neely et al., 2005; Rocha et al., 2020).

The best-known well-integrated models of PMSs focused on quality improvement based on performance measurement are, for example, Total Quality Management (TQM) (Zhang et al., 2021), Just in Time (JIT), Lean Management, Benchmarking (Cugova & Cepel, 2018), Balanced Scorecard, Performance Pyramid, Strategy Aligned Integrated Scoring System (SAILS model), Goal-Resources-Actions-Structure-People model (GRASP model), Kanji' with Business Excellence Model (KBEM) (Janjić, et al., 2015) and others.

As mentioned by Kadak & Laitinen (2021), PMSs play an important role in managerial support of improving and maintaining performance in organizations. PMSs are considered an effective system of responses to several practical and conceptual challenges that organizations face in today's turbulent economic conditions.

It has been recognized that performance management and performance measurement form the basic pillar of effective management of any organization. PMSs are recommended to facilitate the implementation of business strategy and to continuously improve the performance of organizations (Rocha et al., 2020).

An empirical study by Koufteros et al. (2014) demonstrated that PMS improves organizational capabilities, what has a subsequent synergistic effect on organizational performance. Another study demonstrated that organizational ambidexterity facilitates indirect effects of PMSs on organizational performance (Severgnini et al, 2018). Dahlan et al. (2019) concluded that the use of strategic PMSs has a positive effect on organizational performance, both directly and indirectly through the mediating effect of market orientation. The BSC design explained variation across three organizational effectiveness measures in another study: improvements in translating the organizational strategy into operational goals, understanding cause-effect relationships and enhancing internal communication among employees (Lucianetti et al., 2019). A significant impact of the integrated implementation of knowledge management and

comprehensive PMS was demonstrated in a study by Asiaei & Bontis (2020). The positive influence between management satisfaction with PMS and organizational performance is also confirmed by Rikhardsson et al. (2021).

On the other hand, a research by Fisher (2021) revealed that many organizations do not have a consistent and effective approach to performance measurement. Many times, entities have not adopted already designed PMSs, but their systems are the result of an internal evolution. In practice, there are situations where measurements do not provide relevant overviews, do not lead to corrections, and may even trigger dysfunctional employee behavior. Meanwhile, Rikhardsson et al. (2021) failed to empirically verify the link between different PMSs and management satisfaction or organizational performance.

However, not all measurements and PMSs are equally effective regarding organizational performance under different conditions. To ensure the effectiveness of the PMS, the adaptability of the system to the characteristics of the organization and its surroundings is necessary (Hald & Mouritsen, 2018). Organizations operating in different environments have different strategic goals, therefore they require application of different PMSs to ensure their sufficient performance.

### **3 METHODOLOGY**

The aim of the paper is to summarize selected recent empirical findings regarding the various effects of using PMSs on organizational performance in selected sectors of the economy: in public and manufacturing sector. The main used research method is a literature review. This research method allows to identify what has been written on a subject or topic, determine the extent of a specific research area, aggregate empirical findings and identify areas for further research. Only peer-reviewed articles with release dates from 2011 to 2022 from databases Web of Science and Scopus were used for the purposes of this overview.

## **4 RESULTS**

### **4.1 Effects of PMS on the performance of public sector companies**

Over the past three decades, as a part of public sector reforms aimed at improving performance and transparency, attention has increasingly focused on the design and implementation of PMSs in public organizations (Fryer et al., 2009; Evans, 2019). The settings of the PMSs were later under the pressure of the so-called New Public Management regime (NPM) significantly influenced (La Puente & Van de Walle, 2020). The NPM reforms were mainly focused on the implementation of private sector processes in the functioning of public administration organizations (e.g. employment of professional managers, defining standards and performance indicators) and on the external reorganization of public administration (decentralization, increasing competition between sub-units) (Fryer et al., 2009; Buleca, & Mura, 2014). The Anglo-Saxon countries were the first to start operating under the NPM regime, and later it quickly spread, especially in the advanced democracies of the OECD countries (Clifton & Díaz-Fuentes, 2011).

The study conducted by Hvidman & Andersen (2014) focused on the comparison of performance management against real organizational performance outcomes in otherwise similar public and private sector institutions in the education sector in Denmark. The conclusion of the study is the confirmation of the impact of performance management techniques depending on the sector, in this case private vs. public. Performance management techniques in

private organizations in this study confirmed a positive impact on improving organizational performance, in the case of comparable public organizations this impact was not confirmed.

One of the larger empirical studies focused on the effect of PMSs on organizational performance of public administration entities is based on the survey data of 101 public institutions in the Dutch public sector – country that uses the aforementioned NPM approach. The authors assumed that PMSs have an impact on organizational performance and that it is dependent on contractibility. Contractibility consists of the clarity of goals, the ability to choose unbiased performance metrics, and the degree of knowledge and control of the transformation process by managers. The results show that the incentive-oriented use of PMSs has a negative impact on organizational performance, but as the contractibility increases, this impact is less severe. The authors also concluded that exploratory use of PMSs has a positive effect on organizational performance regardless of the degree of contractibility. The effectiveness of implementing PMSs in public sector institutions has thus been shown to be determined both by contractibility and the ability of managers to use these systems (Speklé & Verbeeten, 2014).

Gomes et al. (2017) based on assumptions of the contingency theory investigated the extent of PMS usage by Portuguese government agencies and its impact on organizational performance. The result of the study using multivariate analysis is the confirmation of a positive association between the level of PMS usage by government agencies and the performance of the organization. Citizen orientation and the ability to innovate and improve have been proven to be strong determinants of organizational performance in the organizational context of the public sector. Public institutions using PMSs at the same level will demonstrate different levels of performance (mainly in meeting goals and internal performance) depending on the pro-civic strategy and competitive level (Tran & Nguyen, 2020).

Another study revealed empirical evidence of the effects of the PMSs mechanism on the organizational performance of public sector entities in Vietnam - in a developing economy – on a sample of 400 samples. The assumption that if public organizations apply PMSs successfully, they have the opportunity to accurately assess their organizational performance, was not confirmed. The assumption that the application of positive PMSs has a positive effect on public accountability due to more transparent provision of information to interested stakeholders was confirmed.

In a recent study on a sample of 155 Portuguese central government agencies, the results show strong empirical evidence of a direct impact of the use of PMSs practices and cultural aspects on organizational performance. The results of the study contribute to clarifying the rational approach of NPM regime initiatives to introduce innovative approaches to performance measurement practices for improving organizational performance. Regarding the moderating effects, the results suggest that if agencies have a focus on internal management practices along with a pro-civic orientation, they have better scope for improving internal performance. If agencies use PM practices under strong political pressure, expectations of an insignificant effect on organizational performance were confirmed (Gomes & Mendes, 2022).

#### **4.2 Effects of PMS on the performance of manufacturing companies**

The modern manufacturing industry is characterized by a significant expansion and growing incentives for a diverse market, therefore manufacturing enterprises are forced to ensure flexibility, very high-quality standards, productivity and sustainability. To fulfill these attributes, manufacturing industries use PMSs to be able to evaluate the operational status of their production activities (Zhu et al., 2019).

In connection with the measurement of organizational performance and the efficiency of production processes, indicators for monitoring the defined goals are most often used in practice in the sector of manufacturing companies, the so-called Key Performance Indicators (KPIs).

KPIs represent a set of quantifiable measurements focusing on the critical activities of the organization and constitute the core of PMSs (Parmenter, 2007). Using KPIs, an organization can identify differences between actual and desired performance. Managers use KPIs to monitor progress, to support the formulation of new goals, to assist in decision-making in order to achieve desired performance and improvement towards the future, and to assist in the overall evaluation of the state and the organizational performance (Varisco et al., 2018). Defined by the International Organization for Standardization, ISO 22400 defines KPIs for manufacturing operations management in two available catalogues: ISO 22400-1:2014 presents definition of KPIs, its relevance and criteria for constructing KPIs and their use; ISO 22400-2:2014 provides information about the KPIs user group and corresponding production methodology (Kikolski, 2020).

The mentioned ISO standard defines a total of 38 KPIs (4 are part of the amendment). As added by Zhu et al. (2017), despite the effort of the standard to be generally applicable to the production sector, KPIs are primarily formulated for the needs of discrete industries and not for continuous processes.

As Khan and Bilal (2019) note, some manufacturers have limited knowledge of the proper use of KPIs, some overuse KPIs so that they cannot effectively track primary objectives, or use KPIs that do not link to objectives.

For the stated reasons, it is not the definition of KPIs in general, but the selection of the most useful KPIs depending on the nature of the production activities and their effective application that is decisive for a specific manufacturing company (see e.g. Amrina et al., 2019).

Empirical evidence on the effects of PMSs on organizational performance, efficiency, or productivity of enterprises in the manufacturing sector is still limited in the academic literature. A study by Oh et al. (2015) investigated the use of PMSs in a sample of 246 Italian manufacturing companies by developing a PMS score, which aggregated the collected data and quantified the implementation and use of PMSs by individual companies. One of the conclusions of the study is a positive and significant correlation of higher quality PMSs with higher organizational productivity.

The study by Barroso et al. (2016) focuses on the impact of specific elements of PMSs (PMS sophistication) on organizational performance on a sample of German manufacturers of electronic equipment. Their model investigates the extent to which PMS sophistication moderates the interrelations between internal values (organizational flexibility, employee engagement, internal efficiency) and performance (customer satisfaction, market performance, financial performance). The results show a negative moderating effect of PMS sophistication on the interrelations between internal efficiency and financial performance. This relationship is significantly weaker for organizations with a highly sophisticated PMS and, conversely, very significant for organizations with a simple PMS (other than e.g. BSC). A positive mitigating effect was confirmed on the interrelations between organizational flexibility and financial performance, and employee engagement and market performance.

Authors Albuhihi & Abdallah (2018) investigated the effects of soft TQM on organizational performance in the Jordanian pharmaceutical manufacturing sector using the BSC perspective and the indirect effects of TQM on financial performance. Soft TQM has a significantly positive impact on the following perspectives: customers, internal business processes, innovation and learning. A direct effect of soft TQM on the financial perspective was demonstrated, and the

customer perspective was shown to be a significant mediator between TQM and financial performance.

A study by Kumar (2019) focused on analyzing the relationship between PMSs and organizational effectiveness based on a survey of 54 Indian companies from the manufacturing sector. A statistically significant relationship between PMSs and organizational effectiveness was demonstrated, while the efficiency of the manufacturing organization is determined by various aspects of PMSs (performance evaluation system, vision and mission of the organization, etc.).

The subject of the study by Ahmad et al. (2022) was an empirical investigation of the extent of use of financial and non-financial PMSs, the relationship between multidimensional PMSs and organizational performance, and factors related to the use of PMSs in the Malaysian manufacturing sector. For the purposes of the study, the authors divided PMSs into 7 research areas: quality and customers, employees, efficiency, innovativeness, competitiveness, social responsibility and financial indicators. The results of the study demonstrated that Malaysian manufacturing firms prefer financial metrics over non-financial metrics. On the basis of a multiple regression analysis of the relationships between organizational performance and different dimensions of PMSs, it was demonstrated that the following dimensions are significantly related to organizational performance: quality and customers, production efficiency, innovativeness, social responsibility and overall use of PMSs. The results support the premise of the importance of using multidimensional PMSs in relation to the evaluation of organizational performance.

## 5 CONCLUSION

This paper summarizes the results of available empirical studies presenting the diverse effects of using PMSs on organizational performance in general and in selected sectors of the economy: in public and manufacturing sector.

Although the issue of PMSs and its impact on organizational performance is frequent in academic literature, contradictions are found in many empirical studies. But it can be concluded that empirical studies with positive effects of PMSs on organizational performance prevail. Investigating the effects of PMSs on organizational performance in the public and manufacturing sector has its specificities, there is not a large amount of empirical data available, but even in those mentioned in this overview - evidence of PMSs positive effects predominate in the public and manufacturing sector.

### **Suggestion for further research**

Future research could focus on the effects of PMSs in relation to organizational performance within other sectors of the economy, such as the service sector, the IT sector, the health sector or the SME sector.

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# ACHIEVING BIG DATA DECISION-MAKING QUALITY THROUGH DIGITAL LEADERSHIP AND KNOWLEDGE SHARING AT TRANSFER POINT IN BIG DATA CHAIN.

*Syed Muhammad Shariq, Rastislav Rajnoha*

## **Abstract**

Providing a mechanism to boost quality data-based decision making through big data analytics which is among the objectives of industry 4.0 by optimizing human or employee capabilities is the main purpose of current study. Interrelated theoretical lens of dynamic capability view and strategic alignment model is used. Data from 305 top manager related to FMCG sector in Pakistan representing south Asian region is analysed by applying structural equation modelling through SMRTPLS. Results provide support in favour of presented mechanism that knowledge sharing mediates the relationship among digital leadership and big data analytics positively which shows positive impact on data-based decision-making quality. Results show that human or employee factors are crucial for achieving big data analytics and big data decision making quality. Without addressing these human or employee factors, big data analytics and big data decision-making quality will not be achieved and implementation of big data solutions in its true sense will remain a dream. Current study contributes towards dynamic capability view and strategic alignment model. Organizations can build alignment among strategic, operational and technical level through its dynamic capabilities at strategic, operational and technical level. Organization has to focus on enhancing their capabilities at all level so that organization may have strategic alignment at all level. Once the organizations have alignment in them at all level their big data decision making quality will improve to great extent and that has been proof by current study data analysis.

**Key words:** *Digital leadership; Knowledge sharing; Big data analytics; Big data decision-making quality.*

## **1 INTRODUCTION**

Venkatraman (1990) claim that strategic alignment along with multiple factors can greatly explain the phenomena's because it can absorb complex and interrelated nature of relationship among multiple factors. This claim has triggered multiple factors to be studied interrelated such as Bergeron (2004); Schniederjans (2009) and Zheng, Yang, and McLean (2010) has done some empirical studies which tested the effect of alignment along with other multiple factors on firm performance. Most recently Al-Surmi, Cao, and Duan (2020) has studied business strategic orientation, IT strategic orientation and marketing strategic orientation for generating alignment at strategic level. Al-Surmi et al. (2020) recommended studying dynamic change of firm's business orientation according to the situation and its effect on alignment model.

Dynamic change of firm's business orientation in the context of current study refers to the transformation of traditional firm into digitalized firm through firm's dynamic capabilities which will create alignment among strategic level with organizational capability "digital leadership", at operational level with human or employee's capability "knowledge leverage" and technological capability "data analytics". How these multiple dynamic capabilities (digital leadership, knowledge leverage and data analytics) from strategic as well as from operational level contribute towards strategic alignment model. Dynamic change of firm business orientation from traditional to digitalized firm for responding to supply chain (planning, forecasting and stock management) disruption caused by covid-19 makes dynamic capabilities

a relevant theoretical lens for creating alignment among strategic and operational level. Strong responsibility lies upon pragmatic domain researchers to develop a mechanism that can guide traditional organizations for their transformation towards digitalization for quality data-based decision making through big data analytics for minimizing the uncertainty effect like Covid-19 has drawn upon supply chain (planning, forecasting and stock management) due to which world including market giants like America and China are worried. Quality data-based decision-making lead by big data analytics will allow organization for a better supply chain management because Marjanovic (2021) has conducted a case study in which decision maker integrate insight knowledge with big data analytics for quality data based decision making which will bring positive impact on forecasting, planning and stock replenishment. Interaction among strategic alignment model and dynamic capability theory through multiple factors or capabilities is interesting and novel idea in post COVID-19 pandemic era which has provided the notion to revisit management theories (Verbeke, 2020) in given circumstances where industrial digitalization is accelerated by COVID-19 pandemic (WTO, 2021).

Weill and Woerner (2018) claims that smart factories possess highly dynamic and reactive capabilities with high standards. Future ready organization and firm with the capability to encounter the upcoming demands of industry 4.0 are earning extra 16% than average net profit margin in the industry (Weill & Woerner, 2018). Organization which are not able to encounter upcoming demands of industry 4.0 will probably suffer or the agile competitors and new startups will play their role in wiping out these firms (Weill & Woerner, 2018).

This conclusion was derived after analyzing data from hundreds of organizations from study, which was conducted in pre-pandemic era. This was the time when globalization was on such a peak where GDP and global trade both increases 26 per cent between 2008 – 2018 (WTO, 2019). Trade tensions among China and America was the only fear faced by the global economy by that time but suddenly Covid-19 pandemic strikes the world at the end of 2019. Covid-19 strikes global economy dramatically. The only sector among goods and services which grows during pandemic is computer services, it shows an increase of 8 per cent which is boosted by shift towards remote working and digitalization. America being the largest computer service provider has achieved 13 per cent growth in exporting software all around the world on the other hand 25 per cent growth is observed in cloud computing and data storage and world trade organization already said that this increases as a result of remote working trend and digitalization (WTO, 2021).

McAfee, Brynjolfsson, Davenport, Patil, and Barton (2012) claimed that organizations adopting big data solutions for their decision-making would be the successful organization. Process involve in value creation from big data is not a simple task, it demands a lot of exertion and accompanied by alignment at operational as well as at strategic level (Awan et al., 2021). Providing a mechanism to boost quality data-based decision making through big data analytics which is among the objectives of industry 4.0 (Jain & Ajmera, 2020) by optimizing human or employee capabilities is the main purpose of current study. Surbakti, Wang, Indulska, and Sadiq (2020) conducted a review and highlighted the importance of employee trust on big data analytical results, knowledge and skills. Furthermore, Alharthi, Krotov, and Bowman (2017) and Li, Peng, and Xing (2019) also claimed that human or employee related barriers are among the major reasons for failure in big data implementation.

Current study summarizes most of the human or employee-oriented factors like trust in big data analytical results, skill and knowledge under knowledge leverage specifically tacit knowledge leverage. It is also recommended that in digital era after covid-19 pandemic, the first best step towards digitalization is to focus on the soft skills because the main hurdle in achieving digital transformation successfully is shifting the mindset of employees (Hugh Bachmann, Keith Beattie, Paolo Stefanini, & Welchman, 2021).

## 2 LITERATURE REVIEW

### 2.1 Digital leadership and big data analytics.

In this digital era, leader must have transformative vision, digital literacy and general leadership skills like team building and collaboration (Kane, Phillips, Copulsky, & Andrus, 2019). Leader should take step forward for collaboration among employee to frontward routing by utilizing information technology (Anak Agung Sagung & Sri Darma, 2020). Anak Agung Sagung and Sri Darma (2020) and Kane et al. (2019) claimed that these characteristic belongs to digital leadership. Implementation and development of big data analytical capabilities are associated with decision making culture and IT leadership (Grover, Chiang, Liang, & Zhang, 2018). Kane et al. (2019) claimed that understanding of technology is among the top three skills that the digital leadership should possess. Its mean that IT leadership is among one of the characteristics of digital leadership. Big data analytical capability based on decision making culture and digital leadership is costly and hard to imitate (Grover et al., 2018). As authors have earlier reported that 70 per cent of transformation fails, McAfee et al. (2012) highlighted that lack of suitable leadership is one of the major reasons. Leadership with clear big data analytics strategy is most likely to succeed (Grover et al., 2018) and it is already discuss that digital leadership step forward to frontward routing by utilizing information technology (Anak Agung Sagung & Sri Darma, 2020). Based on the arguments current study proposed below hypothesis.

H<sub>1</sub>: Digital leadership has a positive effect on big data analytics.

### 2.2 Digital leadership, Knowledge sharing and big data analytics.

Phillips-Wren, Daly, and Burstein (2021) suggest that knowledge phenomena could enrich data analytical capability of the firm. Janssen, van der Voort, and Wahyudi (2017) also highlighted the importance of knowledge in big data analytics through addressing data transfer points by claiming that the transfer authorities do transfer relevant and required data but they hold insight knowledge related to transferred data.

Importance of knowledge in current study context is much higher because for the transformation of firm, firm need to hire or appoint two personnel including data scientist and analytics expert however business user or end user of big data analytics will be the internal existing old employees. Notion to these terminologies were coined by Eckerson (2011) in which author introduces two authorities concerning big data analytics, first is power user and second is casual user or business user. However Phillips-Wren, Iyer, Kulkarni, and Ariyachandra (2015) extended these authorities in big data analytics architecture. They named first authority power user as data scientist, second authority as business user or end user similar to Eckerson (2011) and added third authority named business analyst same authorities were also addressed by Watson (2019) and most recently by Phillips-Wren et al. (2021) who defines business user or end user as “a consumer of descriptive and predictive analytics targeted to their business decisions”. Analytics expert is defined as a person who is able to perform analysis using sophisticated analytics software and data preparation techniques furthermore it has computer coding skills applicable to some application and ability to employ visualization technologies to aid analysis. Phillips-Wren et al. (2021) also define data scientist as a highly adaptive technical person who can move freely throughout the process-flow from back-end data sourcing to front-end decision making. Data scientist has advanced computer coding and statistical analysis skills that allow them to move data into and bring data from the data lake, utilize cluster computing, interact with data wherever they reside, creates new models and visualizations.

As far as data scientist and analytics expert are concerned, they may be on company payroll or they may be on contractual basis or even as consultants but business user or end user who is the

consumer of big data analytics has to be the internal existing employee which were operating the firm's operations before digitalization because Cascio (2002) advised organizations that while applying strategies for restructuring of the firm, show value towards employees. As it is already discussed in introduction section that future ready organizations are earning extra 16% from industry net profit margin (Weill & Woerner, 2018) but it does not means that organizations should disown their existing employee as it was done in the past by organizations and those firm faces huge losses latter on (Cascio, 2002). Cascio (2002) said it does not matter how huge budgets the firms have for its transformation because money does not think; it is the case with machines, it does not matter how advance machines and technology the firm have for its transformation as machines work efficiently but they did not invent. Thinking and inventing are carried out by the only long-term source of innovation and renewal that firms possess: smart, well trained employee (Cascio, 2002).

Important point in current study context is the indications of Janssen et al. (2017) who highlighted knowledge hoarding activities from data transfer points and Phillips-Wren et al. (2021) who claimed that knowledge could play fodder role in effective and efficient data analytics. When these arguments are reviewed in current study context it becomes obvious that there has to be some strong knowledge linkage among business user or end user who is the consumer of big data analytics and analytics expert.

Knowledge has a complex nature (Nonaka & Peltokorpi, 2006) and the tacitness of knowledge makes it more complex entity (Shariq, Mukhtar, & Anwar, 2019). About 42 per cent of organizational knowledge is owned by employees in their mind (Singh, 2008). Gap highlighted by Janssen et al. (2017) that knowledge related is transferred data is hoarded by the transfer points or transfer authority. Digital leadership will promote collaboration in term of data related knowledge sharing at transfer points in big data chain with collaborative characteristic (Anak Agung Sagung & Sri Darma, 2020; Kane et al., 2019) because digital leadership is a knowledge oriented leader (Klein, 2020). Zia (2020) recently reported a positive effect of knowledge-oriented leadership on knowledge transfer and knowledge acquisition. Knowledge leverage in current study context is composition of knowledge acquisition and knowledge transfer which are the component of knowledge sharing. Behavioral thinker suggests that the best suitable leadership can bring the desired outcomes automatically (Singh, 2008). Digital leadership has all the characteristic for implementation and development of big data analytics which were discussed earlier in detail. Furthermore, digital leadership will also promote data related knowledge sharing at transfer points in big data chain among business user or end consumer of data analytics and analytical expert with its collaborative characteristic for promoting data based decision making culture because Kane et al. (2019) argue that it is difficult to teach technologist that they need to lead strategic knowledge effectively. So current study suggest that digital leadership should promote data related knowledge sharing at transfer points in big data chain among business user or end consumer of data analytics and data expert so that a data driven culture should prevails in the organization which will play their role in building strong big data analytical capabilities (Grover et al., 2018). Data related knowledge sharing at transfer points in big data chain is important because if business user or end consumer of data analytics transfers all the possible data related knowledge to analytical expert along with data it will help data analytical expert in improving data preparation and data analysis. Janssen et al. (2017) argues that data related knowledge sharing at transfer points in big data chain is crucial for big data analytics. whereas, Phillips-Wren et al. (2021) argue that knowledge could be as crucial for big data analytics as fodder. Based on the arguments current study proposed below hypothesis.

H<sub>2</sub>: Knowledge sharing at transfer points in big data chain mediates the relationship among digital leadership and big data analytics.

### 2.3 Big data analytics and big data decision making quality.

Big data analytics has gained an importance in organizations due to which scholars has started exploring the impact of big data analytics on decision making (Awan et al., 2021). Significant importance has been given to big data analytics for decision making by academic and practitioners (Gupta, Chen, Hazen, Kaur, & Gonzalez, 2019). Currently big data analytics role is somehow limited towards firm performance (Gunasekaran et al., 2017) and innovation (Ghasemaghaei & Calic, 2019; Wamba et al., 2017) . However, big data analytics extract meaningful insights for production to maximum resource utilization (Gupta et al., 2019). Grover et al. (2018) claimed that top three organizations in the relevant industry using big data decision-making are approximately 5 per cent more productive and more 6 per cent more profit as compare to their competitors. They also claimed that big data decision-making quality is one of the outcomes of big data analytics. Janssen et al. (2017) argue that by improving decision-making quality, value can be produce but research on decision making through big data is scarce. It is also assumed that big data analytics can improve decision making quality but it might be too simplistic assumption (Janssen et al., 2017). Based on these arguments and suggestions current study proposed below hypothesis.

H<sub>3</sub>: Big data analysis has a positive effect on big data decision making.

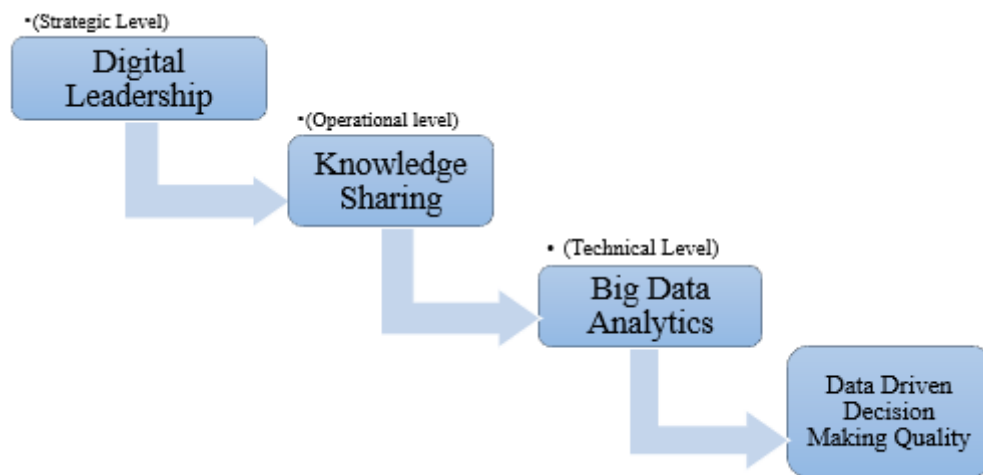


Fig. 1 – Framework. Own source

## 3 METHODOLOGY

Current study adopts pragmatic deductive approach and uses survey strategy to collect data from 305 senior personnel in FMCG sector operating in Pakistan.

Sample organizations from FMCG sector were firm operating in whole south Asian region or in some specific countries of south Asian region are controlled by a single authority. All these firm uses artificial intelligence to some extent based on big data due to which these firms were selected as unit of analysis for current study.

### 3.1 Data collection

Data collection procedure is proceeded by visiting regional offices in Pakistan or through email and telephonic contact in some cases. We requested senior manager to respond to our questionnaire and then we used snowball sampling by requesting respondent to refer us to another potential respondent. All the respondents were at key positions in different departments and actively involved in decision-making process. In this way, we managed to distribute 848



questionnaire and after strong follow up we received 329 questionnaires in return, out of which 305 were usable.

### 3.2 Measures

A seven-point Likert scale is utilized to measure the construct through adapted scales. Digital leadership was measured using a four items scales adapted by Zeike, Bradbury, Lindert, and Pfaff (2019). Big data analytics was measured as second order construct using a fifteen item scale out of which three items are for infrastructure flexibility, three items are for management capabilities and three items relates with personal capabilities. These scale is adapted from (Akter, Wamba, Gunasekaran, Dubey, & Childe, 2016). Nine item were related to big data quality which is considered as an integral element of big data analytics in current study, these scales were adapted from Awan et al. (2021).

Knowledge sharing at transfer points in big data chain is measured by using seven item scale adopted through (Wang & Wang, 2012). Big data decision making quality was measured through four item scale adapted from El-Kassar and Singh (2019), Powell (1992) and Shamim, Zeng, Shariq, and Khan (2019) respectively.

## 4 RESULTS

### 4.1 Reliability and validity

Reliability and validity for the constructs was confirmed by applying confirmatory factor analysis. Indicators whose reliability was not up-to acceptable level were not considered for further analysis. All the results related to reliability of the construct are presented in below tab.1 including the convergent validity.

Tab. 1 - Reliability and validity. Source: own research

Reliability and validity	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Big data analytics capability	0.885	0.891	0.908	0.524
Big data decision making quality	0.815	0.835	0.878	0.646
Digital leadership	0.684	0.705	0.827	0.618
Knowledge sharing at transfer points in big data chain	0.767	0.779	0.849	0.584

### 4.2 Discriminant validity

Following Fornell and Larcker (1981) Discriminant validity is also confirm in below tab. 2 where the diagonal value represents the square root of AVE while all the underlying value represent the correlation among the latent variable.

Tab. 2 - Discriminant validity. Source: own research

Discriminant validity	1	2	3	4
1 Big data analytics capability	<b>0.794</b>			
2 Big data decision making quality	0.729	<b>0.803</b>		
3 Digital leadership	0.775	0.617	<b>0.786</b>	
4 Knowledge sharing at transfer points in big data chain	0.451	0.452	0.335	0.764

### 4.3 Hypothesis testing

Partial least square (PLS) structural equation modelling is used to observe endogenous variable variations and path coefficient through PLS algorithm. Path coefficient significance is derived through bootstrapping procedure at 5000 runs to check whether the results are significance and found that all hypothesis are accepted with a significant level of 0.001 as depicted in tab. 5 below.

Tab. 3 - Hypothesis Testing. Source: own research

Path coefficient	$\beta$	T Statistics	P Values	Hypothesis	Accepted
Digital leadership -> Big data analytics capability	0.703	20.508*	0.01*	H <sub>1</sub>	Accepted
Digital leadership -> Knowledge sharing at transfer points in big data chain -> Big data analytics capability	0.072	3.591	0.01*	H <sub>2</sub>	Accepted
Big data analytics capability -> Big data decision making quality	0.79	32.448*	0.01*	H <sub>3</sub>	Accepted

## 5 DISCUSSION

Study was initiated for addressing the problems faced by the organizations, which are not in the category of future ready organization due to serious threats to their existence. First of all factors were identified which were considered as hurdle or barrier in implementation of big data analytic which is crucial for transformation of traditional factories into smart factories. Li et al. (2019) identified three factors but the current study has addressed the one human or employee factor only. Current study proposed a model based on organizational optimization in which knowledge sharing at transfer points in big data chain was aligned for big data analytics and big data decision-making quality through proposed hypothesis based on research objective. After a detail data analysis, answer to research question that how digital leadership will optimize human or employee factors for big data analytics and big data decision making quality has been addressed.

Digital leader will create a big data data decision making culture in organization will impact big data analytics and leader efforts towards promoting knowledge sharing at transfer points in big data chain help organizations to improve their big data analytical capabilities, as knowledge sharing at transfer point in big data chain mediates the relationship between digital leadership and big data analytics.

## 6 CONCLUSION

Study is being conducted for survival of those firms that are not in category of future ready organization. Study has proposed a model through which, factories would be converted into smart factories for their survival. Data is been collected from 305 top managers of the FMCG firms in Pakistan that represents south Asian region. Structure equation modelling is applied with bootstrapping for mediation test, results shows that human or employee factors are crucial for achieving big data analytics and big data decision making quality. Without addressing these human or employee factors big data analytics and big data decision making quality will not be achieved and implementation of big data solutions in its true sense will remains a dream.

As discussed earlier in the introduction section, the current study contributes towards a dynamic capability view and strategic alignment model. Organizations can build alignment among strategic, operational and technical levels through their dynamic capabilities at strategic, operational and technical levels. Organizations have to focus on enhancing their capabilities at all levels so that organizations may have strategic alignment at all levels. Once organizations have alignment in them at all levels their big data decision-making quality will improve to a great extent and that has been proved by current study data analysis.

Literature is also suggesting to discuss organizational-oriented, technical and data-oriented barriers which need to be addressed in the future. Furthermore, phenomena like trust, digital efficacy in context on big data chains should be discussed in the future.

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# IMPLEMENTATION OF BLOCKCHAIN TECHNOLOGY IN ACCOUNTING: TRIPLE-ENTRY ACCOUNTING

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## **Abstract**

Blockchain technology has already started attracting accounting professionals to triple-entry accounting systems. It is an application of Blockchain, which can be utilized to have a shared accounting ledger and is speculated to revolutionize the accounting profession, including auditors. This system has not been adopted widely by the companies yet; however, it shows great potential and is in discussion in the accounting community for its prospects for accounting practices. It was developed by combining existing technology with cryptography, which helped introduce transparent, authentic, and established transaction records on Blockchain's giant shared ledger. Therefore, this paper aims to investigate the available literature on the impact of blockchain application in accounting, specifically in the context of triple-entry accounting. For this purpose, a detailed literature review was conducted. It was found that the companies will need only to enter the transactions on their ledger internally, and a duplicate copy will be entered on the shared register as well. It is also a decentralised and distributed database which can make the fraudulent practices data manipulation obsolete. It will allow the companies to maintain more transparency. The accounting and auditing profession are built upon trust and transparency, and this technology can help them tackle the troubles they face. Triple-entry accounting can critically enhance the capabilities of accounting practices when appropriately implemented.

**Keywords:** *Blockchain, bookkeeping, cryptography, Double-entry accounting, Single-entry accounting, Triple-entry accounting*

## **1 INTRODUCTION**

The introduction of the internet has allowed the banking system to evolve as a third party for electronic payments, resulting in the rise of the cost for each transaction associated with both concerned parties (Nakamoto, 2008). However, bitcoin (the first cryptocurrency based on cryptographic proof) emerged as an alternate to this system, eliminating the third party from the whole transaction and bringing transparency and stability to the process (Agnese, 2021). This operation is built around a blockchain technology that allows storing the information in blocks. A new 'block' will be added in chronological order with every new Bitcoin transaction. It also downloads a copy of the data whenever a new participant joins the network (Swan, 2015). Hong & Rong (2018) described Blockchain as an open ledger, whereas Deloitte (2016) referred to it as a trust-less distributed ledger.

The aim of designing Blockchain was to assist bitcoin technology; however, it evolved from a supporting tool to technology with a significant influence on financial and other related services. This technology has also attracted the accounting and financial managers because of its security, obscurity, and data integrity while keeping the third parties away from the whole transaction process. Even its technical challenges and limitations have attracted more attention from researchers. Fanning & Centers, 2016 have speculated that this technology will evolve and have a significant impact irrespective of the future of Bitcoin. This will provide solutions for the transactions being conducted with minimum uncertainty (Iansiti & Lakhani, 2017). Swan, 2015 argued that this would lead Blockchain to become the fifth disruptive computing paradigm.

Many studies have been conducted to explore and understand the techniques for implementing Blockchain in different sectors. Its application in the accounting sector remains debatable, mainly because it is a shared ledger (Fullana & Ruiz, 2021). Blockchain has been defined as the evolution of single-entry accounting to triple-entry accounting (O'Leary 2017). This is one of the main reasons for working on this paper.

Many industries have adopted blockchain technology, but it has only limited research in accounting (Yu, et al., 2018). They also speculated that it would help solve the problems related to trust and communication errors in the accounting process. Demirkan, et al. (2020) also talked about the need for blockchain technology in the present day, especially in the accounting world, adding that it can also measure and verify the transactions without the help of any middleman. This will provide the companies with enhanced transparency and a mode for cutting costs. The increased trust will help the companies present their financial data without discrepancies, which is essential for them (Fullana & Ruiz, 2021). Cai (2021) argues that implementing Blockchain in accounting would benefit every stakeholder in the company.

Based on the above discussion, following research objective can be formulated: investigation of the existing literature; how to integrate blockchain technology with accounting; and understanding the single, double and triple entry accounting. The main reason was given by Fullana & Ruiz (2021) to understand triple-entry accounting is that the Blockchain is formulated on triple entry accounting. The triple entry accounting verifies the double-entry accounting twice (Cai 2021).

A literature review will be conducted to accomplish the research goal. Since there is no single case of Blockchain implementation in accounting yet, research methodologies like case studies or research models won't be used except for the literature review. This also shows us the limited studies available on blockchain implementation in accounting. Hence, this paper will be of interest for further studies for the empirical research to analyze the pros and cons of Blockchain. With the advancements in technology, now it is high time for the accounting managers and experts to collaborate with the I.T. professionals to explore and exploit this technology.

## **2 LITERATURE REVIEW**

With the earliest records from 3500BC, Accounting is considered, by many, one of the oldest professions in the world, although classical accounting is only about a few centuries old. That included maintaining the transactional records by the single party, who were mainly the sellers. Ledgers were held to keep a record of the movement of the goods. The main concern with the single entry of the transactions was the limitation to tracking the errors and the transparency, which would lead to an increase in frauds (Perry, 1996). The merchants introduced double-entry accounting during the renaissance period to tackle this problem. This would require keeping the record twice with the seller and buyer for each transaction. This type of accounting is still in use by accountants across the globe. This also helps auditors since this keeps track of each transaction recorded twice on the system from both sides. If any of the both recorded transactions have any errors, it allows them to look back to the original entry of the transaction source; helping the companies to avoid any intentional or accidental mistakes in their system

Double-entry accounting has been in use for almost 600 years. It was an upgrade from single-entry accounting, and even this upgraded process was not fully able to avoid and deal with the frauds. There are many cases where people fabricated fake transactions in the system, even when the companies were maintaining their records by themselves. To avoid all these issues, companies go with regular audits, which are costly and time-consuming. Since it is impractical to go through all the financial records and transactions, auditors examine only a tiny sample of the data, which can't confirm the absence of any fraudulent practice in the company. The



financial cost of auditing can lead to auditing being done only once a year in most companies. This gives the fraudster ample time to commit the crime and manipulate the transactions.

## **2.1 Existing literature on Blockchain in accounting:**

Triple-entry accounting offers enormous possibilities to accounting managers. Despite that, there are only limited studies available on this topic. Schmitz & Leoni (2019) were only able to find seventeen research papers on Blockchain in accounting published between 2008 and 2018. Most of the documents published on this topic only talked about the conceptual side of the Blockchain in accounting and what would be its possible inference on accounting. However, Ijiri (1986) was most cited among the papers discussing Blockchain with triple-entry accounting. But they could not identify whether Ijiri's framework was related to the Blockchain or not.

Furthermore, some researchers misinterpreted his work and considered this the first instance of the association of triple-entry accounting with the Blockchain. Dai & Vasarhelyi (2017) were among the first to mention triple-entry accounting with Blockchain. They proposed to develop a new accounting system with blockchain layer on top of the existing double-entry system. With the entry of every transaction on the system, a copy will be recorded on the blockchain ledger. A token transfer would be initiated with each transaction entry on the new ledger between the credit and debit accounts. This would allow every blockchain account to be associated with its corresponding ERP system. These ledgers can be used as certificates by the companies to prove their authority and ownership over the assets involved. The third ledger proposed by Dai & Vasarhelyi (2017) is an independent decentralized blockchain database, unlike Grigg (2005) suggested, which was supposed to be shared by the involved companies themselves. However, they did not encourage replacing the existing ERP system; instead suggested implementing a blockchain-based third ledger over the current system.

The major players in the accounting sectors are big four (KPMG, Deloitte, PwC, and EY). They have been engaged in research and development in blockchain technology more than the accounting academicians (Karajovic, et al., 2019). In 2016, Deloitte developed Rubix, a software platform to work on the development of payment and digital banking. Same year PwC also introduced DeNovo, a forum dedicated to FinTech innovations. EY came up with its Blockchain in 2017 called EY Ops Chain, focusing on "pricing, digital contract integration, shared inventory information, invoicing and payments" (EY, 2019). KPMG also collaborated with a blockchain company, Guardtime, in 2019 to offer their services to clients in this area (KPMG, 2019). It showed how the big four are dedicated to exploring blockchain technology's possibilities in accounting and finance. Deloitte was one of the first companies to recognize the potential of Blockchain in accounting by discussing triple-entry accounting with Blockchain in an article published in 2016. The document said, "instead of keeping separate records based on transaction receipts, companies can write their transactions directly into a joint register, creating an interlocking system of enduring accounting records" (Deloitte, 2016). The document also discussed how this third ledger will be more efficient and faster and can remove the necessity of request and confirmation, making auditing uniform and straightforward.

## **2.2 Blockchain in Accounting:**

Financial frauds are the crimes that are prevalent in the business world and have damaged the reputation of companies and harmed the investments they receive and the country they operate in. Ramírez-Orellana et al. (2017) have mentioned a few companies like Gowex and Enron involved in such activities. This has caused considerable mistrust among the investors towards the accounting information these companies have. Gowex indulged in extensive financial

statement manipulation (Gurrea 2015). They were found to have fake invoices for their revenues.

Additionally, since only a sample of the statements is analyzed during the auditing process, auditors do not go through their all invoices, which meant the fraud was not identified during this crucial process. This could have been avoided just by providing the required facts to support the company's earnings. Many financial experts wonder how they can prevent these frauds. Another issue they are worried about is the transparency of the economic data, which cannot be changed by any employer or employee in the company. Eventually, they realized they had the answer to all these obstacles in a blockchain technology that appeared just over a decade. It provides the proper storage of data that cannot be altered and is easily accessible.

Shatoshi Nakamoto first mentioned blockchain technology in his 2008 paper: "Bitcoin: A Peer-to-Peer Electronic Cash System" (Nakamoto, 2008). He used the already existing technologies like digital time-stamping or Hashcash (Back, 2002). He put these together in an agreement that promoted participation. Initially, blockchain technology was developed for Bitcoin, a digital currency (O'Leary, 2017). Iansiti & Lakhani (2017) explained Blockchain as "that it is an open and distributed ledger system, where users can record transactions without third parties". The recorded transactions will be visible and accessible to every user while lowering the operational cost simultaneously (Catalin & Gans, 2016). This made the whole process transparent and ceased any efforts to manipulate it.

Additionally, Blockchain has many other advantages, including the increase in the capabilities of the transactions in the stock market, avoiding data manipulation, automatic and better transaction recording and protection, and cheaper services compared to the other financial institutes. This makes the process faster and easier for the upcoming trade contracts. While considering its disadvantages, it can only process a limited number of transactions on a public blockchain system used for Bitcoin. However, even this problem can be overcome by using other blockchains such as Ethereum or Quorum, which provide a higher transaction rate. These blockchains are semi-permissioned networks or Hyperledger used for the private network. Blockchain technology can help financial institutions improve their efficiencies if appropriately exploited. Although it still needs some proper regulations and legislation to be implemented to avoid any of its negative implications. It may require more time and effort to be implemented in the accounting sector.

### **2.3 Triple-entry accounting:**

Ijiri first mentioned triple-entry bookkeeping in his work in 1986 (Ijiri, 1986). However, there was no such technology as Blockchain at that time. He did not consider the current accounting system a flawless system, and he proposed to make it so with the introduction of triple-entry bookkeeping. What sets double and triple entry accounting apart is that later one has offered the inclusion of a third financial statement. These three statements are the wealth, momentum, and force statements. The wealth statement consists of the wealth and the income of the organization. In the momentum statement, Ijiri (1986) proposed including the annual accounts comprised of the data regarding the organization's revenue. It will consist of two columns, each used to calculate the organization's net worth. And the force statement is supposed to contain three columns, each containing the single-entry transaction, which would be made based on the triple-entry bookkeeping.

Grigg (2005) was the second academician to talk about triple-entry accounting in his works. It is important to note that Ijiri's (1986) work did not relate to blockchain technology. However, Grig's work might have some influence on its development. Grig (2005) argues that because of the technical qualities, the digitally signed receipts verify transactions conducted with solid

proofs, which can be used in response to the double-entry bookkeeping. This digital property of triple-entry accounting makes it superior to double-entry. Earlier, the problem was with a separate proof of the receipt, which can be solved by having a digital receipt shared by both parties and having the authority to make a copy for their further use.

This all sums up three separate entries for each transaction, each with a particular role. Grigg (2005) also says, "our term of Triple-Entry bookkeeping recommends an advance in accounting, rather than a revolution." It can be concluded that he was the first person ever to think and propose to have cryptographically protected digitally generated receipts. This made identifying any deletion, changes, or anomalies in the recorded transactions easier. There is a possibility that the researchers could have used it as the foundation for blockchain technology and bitcoin. It is also essential to understand that this technology can make accounting more manageable and reliable for organizations.

#### **2.4 Accounting and triple-entry accounting:**

The accountants have realized a need for trust, transparency, and elimination of any third party involved in the transactions. For now, they have to rely on their faith in the honesty of the ledgers and the auditors. It can be said that the ways should be explored for integrity in accounting. This does not mean anything against the existing system; however, blockchain technology can fulfil the gap of a new bookkeeping system. It will assist with overcoming the limitations of the current traditional reporting systems (Libby, 2017).

Blockchain technology is a decentralized and distributed database that avoids data manipulation. It was used to make Bitcoin transactions fluent. It is built on network nodes that no one can control; however, whoever owns the highest number of validating nodes can divert the direction of blockchains evolutions. Still, this technology is considered secure because of its cryptographic system (Yu, et al., 2018). Furthermore, Lemieux (2016) also affirms technology's reliability if it represents the correct file and verifies that the file is not corrupt. It is also important to note that the document will be moved from a centralized system to a distributed ledger (Walch, 2015). In simple words, each user in Blockchain has a unique digital id, and when a transaction is being carried out, the receipt is signed digitally. This improves the authenticity process of the entries as they are cryptographical and will be visible to both parties as a 'third entry'. It will be quite an improvement to the current accounting system. So, in triple-entry accounting, there will be a direct connection between the two parties, and the network of nodes will provide proof of transactions. Everything will be automatically recorded without influence from any third party. It will allow everyone to be notified of any operations performed simultaneously. However, it comes with some consequences. Both parties' accountants, auditors, and other professionals will be minimized since there won't be any need to provide support documents for the transaction and verify the receipts of the contract and accounting entries. For example, in a traditional system, a sale of a commodity by party X to Y will be followed by making both parties' selling and buying entries in their respective accounting ledgers. However, in Blockchain, both parties will digitally sign a receipt, including details of the delivered commodity and the price paid after the sale. Since it is distributed and cryptographical, this digital receipt will be encrypted and can't be tampered. In other words, the transaction will be there on the ledgers of both involved parties. A third party will be generated after the transaction over Blockchain, making auditing automated and straightforward. It will include the details of the process, accessible to both parties, and can be validated individually and managed efficiently.

The adoption of Blockchain by companies in their accounting system is speculated to increase their physical and financial performance. Initially, it will make the process easier and faster for the auditors by allowing them to verify most of the economic data, saving a lot of time and

capital. Secondly, the annual financial reports prepared by the companies will be more secure and reliable since all of the transactions carried out are digitally signed and recorded and can't be altered. It is made possible because making any changes in the receipt will require both parties' encrypted signatures and credentials, which means any changes made will be mutual, or they can't have access to do it.

Trust, transparency, ease of auditing, and reconciliation are a few benefits of using triple-entry accounting. It will help the accountants in the company to efficiently manage the accounts, transactions, and reporting process and allow the companies to trust their ledgers. It will also help them in maintaining an unbiased record. It can benefit the smaller companies as it will help them grab opportunities and attract the stakeholders with their internal accounting system and other economic business activities; since each transaction is made over Blockchain, it makes verification easier. All involved parties will have identical and uniform transaction information. Companies should promote its use for transactions with every partner and create a so-called common accounting book.

Ibáñez, et al. (2020) describe that in the automated triple-entry accounting, three separate entries are recorded on the Blockchain simultaneously. The operations are recorded automatically and reconciled without any third party, allowing everyone to be notified of each process simultaneously. Organizations will no longer need any internal accountant, auditor, or expert to issue any receipt of transactions and verify the agreement between two accounting system entries. Hence, removing the need for proof of receipts from both involved parties or proof of any commodity between them. All of the information is available on the network itself. The verification of accounting entries from both parties won't require any mutual understanding between them or between their accountants and auditors. This is one of the most critical advantages of implementing blockchain technology.

It can be concluded that triple-entry accounting is graphic and expressive. This new third party is Blockchain and contains all the details of each transaction that occurred between two parties and is more authentic than double-entry bookkeeping. Simultaneously, it can also be called a verified double-entry accounting where it is consistent with the parties, and the verification of transactions is done by Blockchain. Whatever it is called, it can't be denied that distributed ledger is better than traditional accounting. With the help of authorized node access, anyone can upload the accounting information within seconds; on the other hand, all this information is recorded on the system legally on Blockchain as smart contracts created by transaction orders (Tan & Low, 2019). The implementation of these programs recorded on Blockchain works as receipt and proof of transaction. This transaction record is shared on the network making it accessible to the third parties involved in the whole process. For example, if someone buys a commodity signed cryptographically, the virtual currency will automatically make the payment to the seller's account. A transaction will be recorded on the system containing information about the product's cost and delivery. And the newly generated contract will include all of the data from an invoice, delivery receipt, and signed agreement to the company's accounting record. "The ability to utilize a blockchain that records all information related to a particular transaction in real-time and between multiple parties is incredibly powerful. The applications for automating business process, particularly around payments and controls are seemingly endless." (Forbes, 2017).

### **3 RESEARCH METHODOLOGY**

This is exploratory research constructed over investigative techniques. It follows the elementary and qualitative research approach to identify the current research on implementing triple-entry accounting in companies. The research began by identifying a gap in the phenomenon under

study; then a thorough investigation was conducted by searching secondary data from the following sources; Web of Science, Scopus, library books and Google Scholar. The research papers were identified and analyzed for this purpose.

#### **4 CHALLENGES**

Dai & Vasarhelyi (2017) identified three challenges faced while implementing blockchain technology in accounting: environmental, technical, and organizational. The queries they raised in the technical context are regarding what kind and size of data will be stored on the blockchain system; since the data gathered from the Bitcoin transactions shows the need for extra storage if data from other transactions are also added to the system. Other issues include educating all concerned employees, capital investment, formulating regulations, and standardization of new accounting and auditing norms (Dai & Vasarhelyi, 2017). Rozario & Thomas (2019) mentioned the following challenges: identity theft, loss of personal digital wallets, error in codes and smart contracts, need for high power input, absence of legal regulations, data storage capacity, cyber-attacks, etc. O'Leary (2019) also specified the lack of generalizability in the blockchain technology.

New regulations will be needed to ensure the trust and security of this technology (Zhang & Zhou, 2020). An increase in blockchain technology demand would also increase the demand for blockchain professionals. This would require educating a whole new generation of accountants about this new system (Y. Zhang et al., 2020). Abdennadher et al. (2021) interviewed accountants and identified the following obstacles: overburden of information, updating assurance services, trouble in amending mistakes, and a robust auditing system.

#### **5 DISCUSSION AND CONCLUSION**

Blockchain can be used as an accounting technology that can be utilized for maintaining a financial ledger. The profession of accounting is all about measuring, conveying, and analyzing financial information. Blockchain can improve the filtering, maintaining, and communication of this information. It is a new technology, although it is built upon the existing technologies. It is a combination of internet, cryptography, and protocols governing incentivization that makes the blockchain a trusted and secured system that can carry out the transactions without the need of any third party and is available in digital form. More precisely, it is a digital ledger system. It will allow a trouble-free and well-organized movement of financial data. When implemented, it can change the company's working environment and potentially homogenize its trust. The whole accounting process is based on trust and transparency, consumes a lot of time, and can be futile sometimes. Triple-entry accounting through blockchain can be the solution to all these obstacles. If implemented correctly, it can revolutionize the accounting industry.

Although there is hardly any triple-entry accounting product implemented in any industry available for study now, the prospects we discussed above show the great potential of this technology for accounting in every sector. Its implementation can be foundational for future studies. These can vary from regulatory reasons and security complications to debatable returns. The ongoing and upcoming projects should be followed carefully to understand this technology more precisely.

Businesses have recognized blockchain technology's enormous potential and transformational abilities. Deloitte conducted a global blockchain survey in 2019, including over 1386 senior executives from companies with at least \$500mil annual revenue, and revealed that the FinTech companies are the leaders while exploring the possibilities in blockchain; however, a

continuous diversification can also be noticed. But all would agree that this technology can serve as a technology to connect many processes. This has transformed the question 'will blockchain work?' to 'how can we make blockchain work for us?' (Deloitte, 2019).

The accountants can utilise blockchain to decrease the cost of maintaining the ledgers for financial data. It will also allow them to make sure the ownership of the assets. It will give the accountants a better look at the available resources and how they can be used to achieve the organization's greater goal.

Compared to the other available latest technologies like machine learning or big data, the prospects for blockchain to be a leading technology used by accountants and other professions are higher. It has been speculated that the knowledge of blockchain will enhance the accountants' efficiency and help them better interpret the available information.

Blockchain in triple entry accounting will remove any kind of appeasement. It will provide a clear history and record of the transaction, which will enhance the scope of the accounting profession. It will put forward many areas under scrutiny which were earlier considered to be complex to measure, like the value and importance of the information kept by a company. It can easily replace the traditional bookkeeping systems. This can risk the position of the accountant and auditors; however, it can be argued that blockchain will increase the number of tasks they will need to handle instead of endangering their position. For this purpose, accountants and auditors will require not proficient, but at-least understanding this technology.

To include blockchain into the system, it needs to be developed, customised and standardized. This process can take some time because it has been more than a decade since the introduction of blockchain, and it is still evolving, and a lot of work has to be done. Many organizations are already working on this technology; however, there are only a few which moved beyond the pilot study stage. It will be challenging to craft the standards and regulations to utilize blockchain which would require the accounting organizations, bodies, and experts to come together.

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# USE OF AP3I ALGORITHM FOR RADICAL IMPROVEMENT OF ENTIRE PRODUCTION SYSTEM

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## **Abstract**

Paper deals with the innovation or radical improvement of production systems. From the brief literature review, there is clearly a need for radical process innovations. Unfortunately, there are not many studies focusing on that. Companies are more focusing on product innovation or incremental process improvement. That is why an innovative tool or method is needed. The opportunity for radical production system innovation is seen in the use of TRIZ (Theory of Inventive Problem Solving), more precisely, the algorithm based on principles of TRIZ – AP3I (Algorithm for Process Innovation by Increasing Ideality). The use of the algorithm is presented on the production system of a company creating custom lighting installations with the goal of generating of ideas for radical improvement. The algorithm was used only to generate ideas on process changes on high levels segments of the process map. The application shows that the AP3I can be used not only for process innovation but also to redesign the whole production system.

**Keywords:** *process improvement, innovation, TRIZ, business transformation, AP3I, case study, idea generation*

## **1 INTRODUCTION**

Process improvement efforts are mainly aimed at optimizing the current process state. The idea is to eliminate all unnecessary. This approach leads to focus on lower levels of business processes as process steps. Unfortunately, this approach does not provide many opportunities to find highly innovative ideas to change the processes. For that, a broader view is needed. Radical process changes should be done from the upper levels of the company processes. To search for radical change, one must change the process as a whole and only focus on improving individual steps. TRIZ (Theory of Inventive Problem Solving) can help search for innovative ideas. The AP3I (Algorithm for Process Innovation by Increasing Ideality) can be used for that purpose. The capability of using the AP3I algorithm to search for radical improvement ideas for an entire production system is tested in a case study. The AP3I could be a new tool covering a gap in a radical production improvement.

This paper aims to present the use of the Algorithm for Process Innovation by Increasing Ideality for generating ideas to change company business processes as a whole radically.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

Rapidly changing market and customers' demands push companies to search for radical improvements or innovations. (Iizuka & Suematsu, 2022; Martinsons, 1995; Mysachenko et al., 2020; Pilipczuk, 2021; Terziovski, 2002; Villa & Taurino, 2019)

Most studies dealing with radical innovation focus on product innovation (Radnejad et al., 2020). But the achievement of radical product innovation can lead to problems with process redesign, expensive technologies, and production lines often need to be purchased to deliver innovative products. Also, many problems with the process can occur. (Simms et al., 2021)

When companies focus on processes, they approach from the bottom up and deal with continuous improvement instead of radical innovation. Small improvements are beneficial, but sometimes there is a need to rapidly change processes or whole business production systems to adapt to current trends and demands. There should be more focus on innovation approaching from up to bottom point of view. (Gärtner et al., 2022; Radnejad et al., 2020; Terziovski, 2002)

Based on the literature mentioned above, a new tool or approach to deal with the innovation of production systems is needed. The importance of production process innovation is also shown by authors (Okrepilov et al., 2020; Samoldin et al., 2020; Shubbak, 2019; Yu et al., 2018). As a solution, principles of TRIZ could be used to enhance the efforts in production systems innovation.

TRIZ – the Theory of Inventive Problem Solving is based on the evolution of technical systems. This evolution was discovered from reviewing millions of patents. Many useful tools and methods based on the technical system evolution principles can help to search for innovative solutions to problems (Altshuller, 1984, 2000; Fey & Rivin, 2005; Gadd, 2011; Ilevbare et al., 2013; Orloff, 2006). For mention: trends of evolution of technical systems, inventive principles, scientific effects, standards, or contradictions. These tools and many others help achieve the system's ideal state. Ideality by TRIZ is described by equation (1) below. (Dai & Ma, 2013; Shi & Liu, 2010)

$$I = \frac{\sum_{i=1}^n B}{\sum_{j=1}^m H} \quad (1)$$

Where  $I$  is ideality of the system;  $B$  represents benefits, or positive functions of the system;  $H$  means harms, or negative effects of the system;  $n$  is the number of benefits;  $m$  is the number of harms.

AP3I – the Algorithm for Process Innovation by Increasing Ideality is a method based on TRIZ principles designed to improve production processes systematically. The core of the algorithm 3I (Innovation by Increasing Ideality) is a problem-solving method based on several steps that lead the solver through the description of the process and searching for ideas on how to improve the process in a way the problem is overcome. (Sojka & Lepsik, 2021)

The AP3I systematically uses the 3I on the process or its segments to search for new ways to achieve its purpose. The schematic of AP3I and 3I is shown in figure (Fig 1.) below.

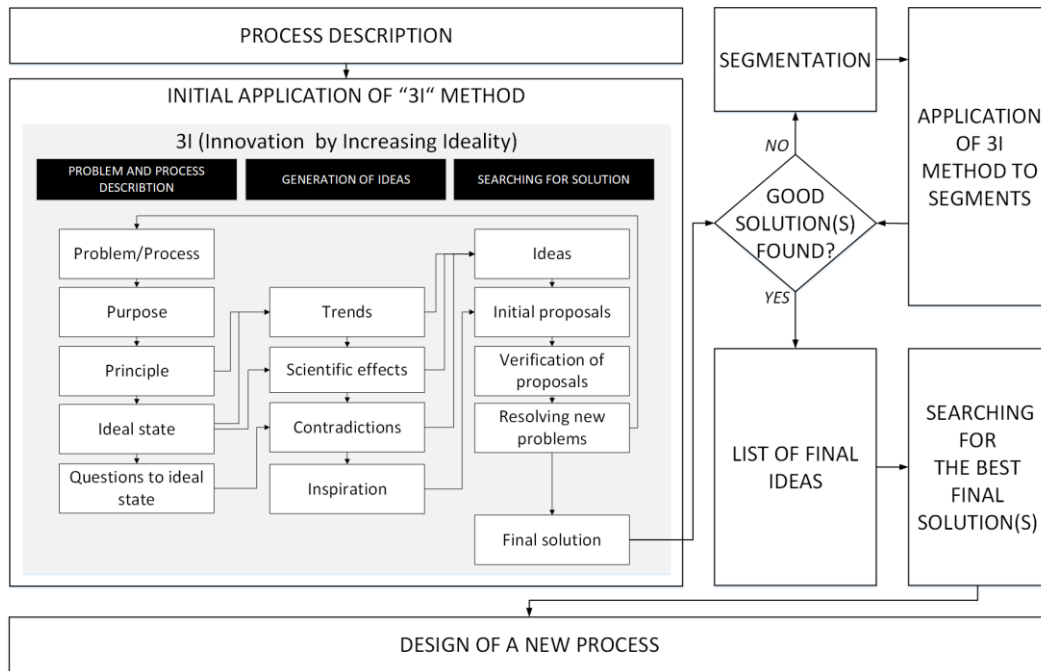


Fig. 1 – Schematics of AP3I and 3I methods. Source: own research

Same as TRIZ, the ultimate goal is to achieve the Ideal state. Since the TRIZ ideality (1) is hard to calculate and it is used mainly for theoretical purposes (Sojka & Lepsik, 2022). An enhanced definition of process ideality was developed. See equation (2)

$$I_p = \frac{\sum_{i=1}^n POd_i + \sum_{r=1}^p POe_r}{\sum_{j=1}^m NI_j + \sum_{k=1}^o NO_k} \quad (2)$$

Where  $I_p$  is the ideality of the process;  $POd$  is the demanded positive outcome of the process;  $POe$  is the extra positive outcomes of the process;  $NI$  is needed input for the process to achieve the demanded output;  $NO$  is the negative outcomes of the process;  $n$ ,  $m$ ,  $o$ , and  $p$  are numbers of positive outcomes, needed inputs, respective negative outputs of the process. The  $POd$  is set to "one," and all other equation parameters are calculated relatively to the unit of the  $POd$ . To compare two process states, the calculation of idealities must also be done by the relative change of parameters in the equation. (Sojka & Lepsik, 2022)

### 3 METHODOLOGY

As proposed in the introduction and theoretical background above, the AP3I method was chosen to generate innovative ideas for radical improvement of the entire production system.

To show how the AP3I can be useful in the efforts for radical change of the whole business process, a case study on the processes in the company Preciosa – Lighting was done. The main products of the company are lighting installations and chandeliers. It is a custom production, so there is high variability in the product's shapes and types. This is also reflected in the production system; overall production is dynamic, and each demand can have a different route through the production process, especially in the manufacturing phase.

Firstly a process map of activities in the company was created. The data for the creation of the overall process map was collected from observing all production processes in the company and discussing production steps with the managers of each department. Due to custom production,

there are changeable connections in the process map. This is why a simplified map was made, which contains all possible departments (or activities) that can be made during production. In reality, there are few cases of demands where all possible steps of the process map are used. This kind of map is crucial for the radical improvement of the system. Then the AP3I was used on each level of the process to search for radical ideas to change. See the process map in figure (Fig 2.).

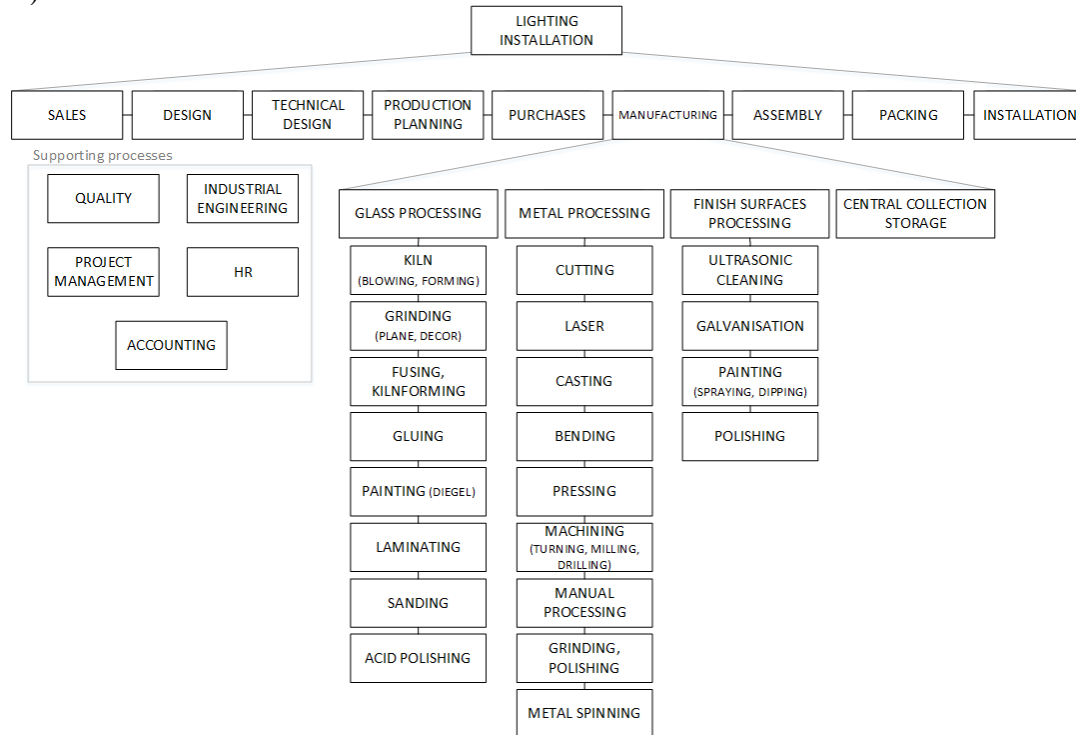


Fig. 2 – Process map of the production system. Source: own research

From the application on level 0 – the whole company only theoretical ways were generated, and no concrete idea was found. That is why the next step was to apply the method to the segments – level 1. Not all departments of the company were included in this study. Example of the application on production is shown in the table (Tab. 1) below, where each line of the table represents one step of the 3I method.

Tab. 1 – Application of 3I method on manufacturing process segment. Source: own research

3I step	Manufacturing
<b>Process</b>	manufacturing of chandelier/lighting - or its parts
<b>Purpose</b>	to make parts of chandeliers - from metal, glass, based on Technical documentation (TD)
<b>Principle</b>	classical technologies of metal machining, and glass production, also surface processing, prototyping
<b>Ideal state</b>	chandeliers in made without prototypes and quality checks on the first try
<b>Question to ideal state</b>	how to achieve that all parts are made on 1. attempt without the need to check them?
<b>Trends</b>	Ideality; increase of information saturation; increase of control; segmentation; transition to micro or super-system; break of borders; dynamization; coordination of actions and rhythm; increase of use of senses, colors, transparency; controllability; reduction of human involvement;
<b>Effects</b>	-

<b>Technical contradiction</b>	IMPROVE: production without checking; WORSEN: cost and time;
<b>Inventive principles</b>	35. Parameter Changes; 28. Mechanics Substitution; 10. Preliminary Action; 1. Segmentation; 18. Mechanical Vibration; 32. Change Optical Properties; 26. Copying; 24. Intermediary, Mediator; 13. Inversion; 27. Cheap Short-living Objects; 2. Extraction, Separation; 15. Dynamics, Dynamization; 12. Equipotentiality; 11. Beforehand Cushioning; 4. Asymmetry; 16. Partial or Excessive Action; 5. Merging, Combining; 21. Skipping; 33. Homogeneity; 30. Flexible Shells and Thin Films; 29. Pneumatics and Hydraulics; 3. Local Quality; 17. Another Dimension; 20. Continuity of Useful Action; 23. Feedback; 34. Discarding and Recovering; 8. Anti-weight, Counterweight; 37. Thermal Expansion; 38. Strong Oxidants; 9. Preliminary Anti-Action; 39. Inert Atmosphere; 31. Porous Materials; 22. Blessing in Disguise;
<b>Physical Contradiction</b>	WANT: no checking to enhance productivity; WANT: checks to provide quality and reduce requirements to process
<b>Separation principles</b>	SEPARATION: time; space; anti-system; micro;
<b>Inspiration</b>	-
<b>Ideas</b>	change of production structure - instead of dpts. Production teams; segmentation of manufacturing to smaller segments; make it another way; dynamics; merging; different dimensions;

The same approach as in table (Tab. 1) was applied to all segments of the production system at level 1. Based on the found trends, inventive and separation principles, and standards from 3I steps, ideas for innovation of process segments were generated. Found ideas for all segments of the production system on which the AP3I was applied are summarized in the table (Tab 2.).

Tab. 2 – Summary of all ideas on improving process segments on level 1. Source: own research

<b>Process segment</b>	<b>Ideas</b>
<b>Sales dpt.</b>	Change of marketing strategy; digitalization of information - customer sees all the info about the project; configurator; 3D visualizations; 3D printed prototypes (models); agile management;
<b>Design dpt.</b>	Configurator; AI to generate 3D model from drawings sketch; Designer together with a customer are creating design; agile management; SW where the core of the installation is defined, then there is possible to change the design of its segments (library of segments, creation of new ones);
<b>Tech. Design dpt.</b>	AI-configuration software; connection/communication between design and TD SW; to make a visual and technical design at once (project team instead of dpts.); agile management; the visual design is made already with technical boundaries/specifications; pre-defined morphological matrix of geometric possibilities of parts order in space - changes of parts design; Standardisation of technical parts;
<b>Prod. Planning dpt.</b>	IS controlling the planning based on data from other dpts.; automatic data creation in production steps;
<b>Purchase dpt.</b>	3D printing of metal parts (few materials unlimited shape; purchase by pull -no storages - longed terms; Technologies for raw materials (ex- from metal scrump, melt and roll new materials based on TD; composite molding;
<b>Manufacturing</b>	change of production structure - instead of dpts. Production teams; segmentation of manufacturing to smaller segments; make it another way; dynamics; merging; different dimensions;
<b>Assembly</b>	models of parts to check fittability; 3D digitalization of real parts assembly test on the digital model;

<b>Packing</b>	Equipotentiality, Another dimension, Mechanics substitution, Intermediary, Segmentation, Parameter changes, Pneumatic and hydraulics, Strong oxidants, Beforehand cushioning, Parameter changes, Cheap and short-living objects, Mechanics substitution
<b>Installation</b>	movable parts (springs); a flexible joint that will become hard after interaction with (sub. Field)

As the next stage of applying the AP3I, another segmentation of the processes should be made. For this study's purposes and practical purposes, only the manufacturing process is segmented deeper. The ideas generated from the application on segments in level 2 are summarized in the table (Tab. 3).

Tab. 3 – Summary of all ideas on improving process segments on level 2. Source: own research

<b>Process segment</b>	<b>Ideas</b>
<b>Manufacturing - glass</b>	glass 3D printing (glass extrusion/glass powder melting)
<b>Manufacturing - metal</b>	metal 3D printing (welding/powder sintering)
<b>Manufacturing - surface finishes</b>	Effect of butterfly wing color (transparent with micro holes)
<b>Manufacturing - CKS (Central completion storage)</b>	SW - controlling the position of parts; small storages in production; process planning to avoid waiting times.

Further segmentation of the process leads to the application to glass production segments: kiln – blowing; kiln – forming; grinding – plane; grinding – decor; fusing/kiln-forming; gluing; painting; laminating; sanding; acid polishing. From the metal production, the segments are: cutting; laser; casting; bending; pressing; machining (turning, milling, drilling); manual processing; grinding; metal spinning. Segments of surface finishing are: ultrasonic cleaning; galvanization; painting – spraying; painting – dipping; polishing.

Due to the complexity of these processes, the detailed application is over the frame of this publication. Since some ideas for improving the production system were found, the algorithm could be ended. For practice, it is recommended to continue with application on lower segments.

## 4 RESULTS

A new production system could be proposed based on ideas generated from the application of the algorithm. From the level 1 segments, the proposal is to redefine borders between departments and merge them. Instead of departments, a more team-focused strategy should be done. Also, a transition to more agile management could be used. Preproduction activities can be enhanced by using special software and artificial intelligence tools – these help to automatically transfer customers' thoughts/requirements into the technical documentation and plan the production capacities. Standardization of materials could improve the storing and purchasing activities in the system. Also, re-processing of waste materials is recommended. Use 3D models from technical documentation to simulate the fittability of the parts, or use 3D digitalized models of real parts. Use membranes in frames instead of paper boxes and packing materials to reduce the use of materials and storage area. Smart materials and mechanisms can be used to improve the installation assembly process. The number of segments is reduced due

to the merging of design and technical design. Also, planning and purchasing can be made automatically by a smart software solution.

Manufacturing was segmented, and ideas for activities from level 2 were generated. Based on that, a new process of production can also be proposed. For glass parts, a new technology of 3D printing can be introduced. There are more variants of how to print glass – it can be melting glass in moving head and laying the layers similarly to FDM 3D printing (Fused Deposit Modeling), or melting glass powder similarly to SLM (Selective Laser Melting) method. Printed parts can be polished in acid, but instead of strong acid, the citric acid solution with additives can be used – the processing would be slower but environmentally better. Production of metal parts could also be enhanced by 3D printing technology. Again, more methods could be used – faster, "welding-based," or selective laser sintering/melting. 3D printing enables the creation of very complex parts, so there is no limitation in design. Also, there is no high requirement on the number of employees in 3D printing production. In surface finish processing, using smart and controllable materials is recommended, using materials and composites to create different colors from the same primary material. Change of managing of the production to eliminate whole central completing storage – there is no need for it. With more effective management, the parts will complete themselves in the assembly station without waiting. To achieve that also here is recommended to transform departments into project teams. Other ideas could be found by continuing to apply the algorithm to lower segments of the production process. Overall the proposed production system is more Industry 4.0 suitable. A comparison of the original state and the proposed changed state of the production process can be seen in the table (Tab. 4) below.

Tab. 4 – Comparison of original and proposed production systems. Source: own research

<b>Parameter</b>	<b>Original state</b>	<b>Proposed state</b>
Number of process segments (lvl. 1)	9	6
Type of management	Department centered	Project and production teams
Technologies	Classical and manual technologies	3D printing with a small number of other technologies
Usage of smart software	Yes – partially	Yes – 100%
Material management	Many material types and variants – big storages	Standardized materials, few types
Reprocessing of waste materials	No	Yes
Design and production shape freedom	High	Almost unlimited
Automatization	Low	High
Autonomy	Middle	High
Ecology	Middle	Less packing materials, fewer waste materials, more environmentally friendly glass polishing
Costs	High	Higher (purchase of technology)



Employees	Lots of workers and lots of mid-management staff	Reduction of workers and mainly mid-management staff
Productivity	Lots of defects	Fewer defects,

From the table (Tab.4), there can be seen that in most of the cases, the proposed state is radically better. The biggest constraint is the initial cost of transformation of the production. It relies on the decision of the upper management of the company.

## 5 DISCUSSION

The results showed that it is possible to use the AP3I method to search for innovative changes to production system transformation. One of the advantages is the top-down approach, instead of searching for innovation by the bottom-up approach – which leads to a higher probability of finding some opportunity for a radical change in the system (Terziovski, 2002). TRIZ principles help search the way of technical evolution, so the idea generation process is much faster than classical approaches. The method can also help with the problem that dominant design in the industry negatively affects radical process innovations (Brem et al., 2016). The AP3I helps search for the ideal state of the process, regardless of surroundings or products. A more sustainable production system can be achieved by pursuing radical innovation much faster than by focusing on optimization or incremental improvements (Radnejad et al., 2020).

As was mentioned above, there is a need for innovation in general. Unfortunately, there are not many tools for the innovation of entire production systems. The proposed use of AP3I can be the solution for this. As shown, several radical ideas on change of production processes were successfully generated.

The limitation of the method is that there is quite a low probability of finding a good solution in the level 0 – idea for the whole production system. Also, it is quite complex when the entire system is segmented, and all segments are considered for searching for their ideal state.

Future research should focus on the development of the algorithm in a way to reduce its complexity on lower levels. When there is a complex production system, segmentation on lower levels of the process, there are too many segments for applying the algorithm. That could be time-consuming. Authors suggest continuing in the development of the AP3I method in the manner of improvement of application for complex systems.

## 6 CONCLUSION

The application of AP3I (Algorithm for Process Innovation by Increasing Ideality) to the radical improvement of the entire production system was demonstrated. The proposed system is mainly based on the 3D printing technology of glass and metal. Also, re-structuralization of management focuses on teams, and higher smart- software support was proposed. The paper showed that the AP3I algorithm is suitable for a search for radical ideas on how to transform business production systems in the evolution of technical systems. The limitation is its complexity in the lower levels of production system, but the biggest innovative ideas for radical improvements should be found on higher levels.

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# “WHAT DOES BRAIN DRAIN BRING IN ITS TRAIN?”... THE CASE OF THE EVER CLOSER EUROPEAN (MINIMUM WAGE) UNION

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## **Abstract**

Despite the fact that migration (particularly labour migration) has fuelled globalisation in the 21<sup>st</sup> century, countries have not necessarily translated it into effective migration and integration policies due to a clash with the call for protection of employment and social cohesion among their citizens. Transnationalism has the potential of multiplication of ties and links across borders; still, ongoing tensions divide the needs of (labour) markets in home and host countries, the strategies of (labour) migrants, and the politics of immigration internationally. In its Presidency Programme (1 January 2022 – 30 June 2022), the French Presidency of the Council of the European Union (post-Brexit EU27) listed a (European) minimum wage among its priorities, and the European Commission signaled “a Recommendation on minimum income to support the policies of Member States” in its 2022 Work Programme. With the first results of the EU27 public consultation “Brain drain” on mind, the aim of our paper was to research the uplifting recent minimum wage developments in the Slovak economy in the context of the ever closer European (minimum wage) Union background as well as in the parallel relevant regional perspective (Association of Southeast Asian Nations, ASEAN). In methodological terms we adhere to the line of economic thought developed chiefly by A. Smith, D. Ricardo, J. Fourastié, P. Sraffa, and Th. Piketty. Our research rests on 2015-2019 data released by the International Labour Organization, the European Union, and the World Bank, with results documenting major discrepancies in (macro)regional (EU; ASEAN) and interregional (EU & ASEAN) terms.

**Keywords:** *international labour migration; minimum wage; post-Brexit European Union (EU27); Association of Southeast Asian Nations (ASEAN); Fourth Industrial Revolution*

## **1 INTRODUCTION**

*“I believe that the combination of structural factors (over-indebtedness and aging societies) and systemic ones (the introduction of the platform and on-demand economies, the increasing relevance of decreasing marginal costs, etc.) will force us to rewrite our economic textbooks. The fourth industrial revolution has the potential both to increase economic growth and to alleviate some of the major global challenges we collectively face. We need, however, to also recognize and manage the negative impacts it can have, particularly with regard to inequality, employment and labour markets.”*

Schwab, K. (2017). *The Fourth Industrial Revolution*. New York: Crown Business.

Over the past two centuries, the pace of technological progress accelerated in line with the process of industrialization, bringing about an increasing role of and the rise in the demand for human capital with ultimate impact on the decline in the gender gap. Yet, various routes to industrialization generated differing economic and social structures. Economic development and economic growth originating in various degrees of endowment, resulting in interactions across state borders, and conveying the idea of improvement of the human condition, have a transnational dimension. In retrospective, with division of labour and specialisation viewed as the source of rising productivity and economic growth; the “invisible hand” of the market

driving investments to the most profitable employment; and profits in turn generating a source of re-investment, it was “national income” that was in the centre of Adam Smith’s attention in his *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776); his perspective, however, was international. So, studies of the globalized economic network as well as the labour market expanding across borders necessitate a transnational approach. Amidst transnational networks of people, information, finance, and commodities, labour migration has been the dominant form of transnational migration in the modern era. Labour migrants are viewed as acting voluntarily; yet, their determination and the circumstances of their migration may not be necessarily arbitrary. Speaking of brain drain, the recent EU27 public consultation “Brain drain” (defining it as emigration of qualified people whose skills are scarce in their place of origin) received among others the following feedback: “*Returning migrants constitutes an important source of development for origin countries, as they transfer financial and human capital to the country of origin.*” (European Union, 2022b). By and large transitory and circular, temporary transnational migration stands for a significant feature of global mobility among others in terms of urbanization, more varied social and economic gender-related opportunities as well as knowledge transfer. While for economists, labour migration forms a part of the world system of flexible flow of capital and labour brought about by liberalism, attention of other social scientists and historians of transnational labour migration is drawn to social changes among migrants and in their host societies. As a matter of fact economic and moral positions have been as often complementary (Stark, 2004) as competing (Branco, 2019).

In its Presidency Programme (1 January 2022 – 30 June 2022), the French Presidency of the Council of the European Union (EU27) listed a (European) minimum wage among its priorities, and the European Commission signaled “a Recommendation on minimum income to support the policies of Member States” in its 2022 Work Programme. With the first results of the EU27 public consultation “Brain drain”, on mind, the aim of our paper is to research the uplifting recent minimum wage developments in the Slovak economy in the context of the ever closer European (minimum wage) Union background as well as in the parallel relevant regional perspective (Association of Southeast Asian Nations, ASEAN). Building on *Part 2 Theoretical background/Literature review* with focus on the concept of the international division of labour in terms of international trade as well as in terms of human capital and its remuneration, in *Part 3 Methodology* we will apply international division of labour to the concept of minimum wage. Subsequently, we will calculate and present data on minimum wages in a (macro)regional (EU; ASEAN) and an interregional (EU & ASEAN) perspective in *Part 4 Results* before interpreting data related to the uplifting recent minimum wage developments in the Slovak economy in a comparative perspective in the EU/non-EU and Fourth Industrial Revolution context in *Part 5 Discussion*.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

*“The first Industrial Revolution started in Britain’s textile industry in the mid-18<sup>th</sup> century, sparked by the mechanization of spinning and weaving. Over the subsequent 100 years, it transformed every existing industry and gave birth to many more, from machine tools to steel manufacturing, the steam engine and railways. New technologies led to shifts in cooperation and competition that, in turn, created entirely new systems of value production exchange and distribution, and upended sectors from agriculture to manufacturing, from communications to transport.”*

Schwab, K. (2018). *Shaping the Future of the Fourth Industrial Revolution*. Penguin Random House UK.

The entire Chapter 1 of Book I of A. Smith’s masterpiece *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776) is oriented on the division of labour, where he points out the famous microeconomic case of the “trade of the pin-maker” with a potential output of 4,800 pins a day based on the division of labour. And it is precisely on the division of labour that A. Smith rests his claim (“*Labour, therefore, is the real measure of the exchangeable value of all commodities.*”), which he further elaborates into the following consideration: “*But though labour be the real measure of the exchangeable value of all commodities, it is not that by which their value is commonly estimated. It is often difficult to ascertain the proportion between two different quantities of labour.*”. If we refer to the principle of “the invisible hand”, then the larger the market, the bigger the benefits of the division of labour (Chartoire, 2019a), *ceteris paribus*. If Portugal was more productive than England both in cloth ( $a^*_{LC} = 90$ ;  $a_{LC} = 100$ ) and in wine ( $a^*_{LW} = 80$ ;  $a_{LW} = 120$ ), then – in line with Smith's theory of absolute advantages – Portugal would, *ceteris paribus*, produce all the cloth and wine for Portugal as well as England (Tab. 1), which is, *ceteris paribus*, “impossible since then England, producing no wealth, would not be able to buy the products it needs from Portugal” (Chartoire, 2019b).

Tab. 1 – Absolute labour costs and advantages (Portugal and England, commodities: wine (LW) & cloth (LC)).

Source: based on Filip (2005) and Krugman et al. (2018).

	$a^*_{LW}$	$a^*_{LC}$	$a^*_{LW} + a^*_{LC}$	$2 \times a^*_{LW}$	$2 \times a^*_{LC}$
Portugal	80	90	170	160	180
	$a_{LW}$	$a_{LC}$	$a_{LW} + a_{LC}$	$2 \times a_{LW}$	$2 \times a_{LC}$
England	120	100	220	-	-

Legend:

$a^*_{LW}$  = Foreign economy unit labour requirements in wine production

$a_{LW}$  = Home economy unit labour requirements in wine production

$a^*_{LC}$  = Foreign economy unit labour requirements in cloth production

$a_{LC}$  = Home economy unit labour requirements in cloth production

A. Smith’s (1776) concept of natural advantages and acquired advantages (“*Whether the advantages which one country has over another, be natural or acquired, is in this respect of no consequence. As long as the one country has those advantages, and the other wants them, it will always be more advantageous for the latter, rather to buy of the former than to make.*”) was further developed by D. Ricardo’s theory of comparative advantage (Tab. 2).

Tab. 2 – Relative productivity (England and Portugal, commodities: wine (LW) & cloth (LC)). Source: Zábajník & Čiderová (2020) based on Filip (2005) and Krugman et al. (2018).

	$a_{LW}/a^*_{LW}$		$a_{LC}/a^*_{LC}$	
England	12/8	150%	10/9	111%
	$a^*_{LW}/a_{LW}$		$a^*_{LC}/a_{LC}$	
Portugal	8/12	67%	9/10	90%

Being more productive in the case of cloth ( $a^*_{LC}$ ) and wine ( $a^*_{LW}$ ), Portugal indeed has an absolute advantage. Still, the seemingly (dis)advantageous position of England/Portugal can be understood in terms of intensity of a comparative (dis)advantage. From such a standpoint Portugal registers a comparative advantage (67%) in wine, and England a lesser comparative disadvantage (111%) in cloth (Tab. 2). In line with Ricardo’s theory of comparative advantages, specialisation of individual countries on their comparative advantage or lesser comparative disadvantage (Tab. 3), *ceteris paribus*, would lead to optimal reallocation of productive resources (England:  $2 \times a_{LC}$ ; Portugal:  $2 \times a^*_{LW}$ ).

Tab. 3 – Comparative labour costs and advantages (England and Portugal, commodities: wine (LW) & cloth (LC)). Source: Zábajník & Čiderová (2020) based on Filip (2005) and Krugman et al. (2018).

	$a_{LW}$	$a_{LC}$	$a_{LW} + a_{LC}$	$2 \times a_{LW}$	$2 \times a_{LC}$	$(a_{LW} + a_{LC}) - (2 \times a_{LC})$
England	120	100	220	-	200	+20
	$a^*_{LW}$	$a^*_{LC}$	$a^*_{LW} + a^*_{LC}$	$2 \times a^*_{LW}$	$2 \times a^*_{LC}$	$(a^*_{LW} + a^*_{LC}) - (2 \times a^*_{LW})$
Portugal	80	90	170	160	-	+10

E. Heckscher and B. Ohlin, however, argue for the case of an exchange of an abundant factor of production for a scarce one; moreover, in terms of the Heckscher-Ohlin-Samuelson-Stolper model, “if country A (industrialized and endowed with a skilled workforce) begins to trade with country B (developing and with an abundance of unskilled labour), the unskilled workers of country A will be put in competition with those of country B. This confrontation will exert downward pressure on wages in A and upward pressure in B” (Gallois, 2019c).

In the example above of an exchange related to wine and cloth between Portugal and England D. Ricardo (*On the Principles of Political Economy and Taxation*, 1817) “limits himself to differences in labour force to explain the specialisation of countries and international trade” (Gallois, 2019a). Ricardo’s approach was later challenged by A. Emmanuel (*Unequal Exchange*, 1972) as follows: “In his well-known example, in which Portugal can produce a unit of wine in 80 hours and a unit of cloth in 90, while England produces the former in 120 hours and the latter in 100, what interests Ricardo is that, after adopting their respective specialisations, Portugal and England together produce the wine and the cloth in 360 hours instead of 390. [...] In what proportion these two countries are going to share this gain of 30 hours Ricardo does not tell us.” (Tab. 4).

Tab. 4 – Specialisation in international trade. Source: Emmanuel (1972).

	Before Specialisation			After Specialisation		
	Wine	Cloth	Total	Wine	Cloth	Total
Portugal	80	90	170	160	-	160
England	120	100	220	-	200	200
			390			360

In contrast with Ricardo’s perception of individual countries’ savings of hours of labour in terms of the theory of comparative advantages, idiosyncrasy of Emmanuel’s perception lies in the savings of 30 hours of labour as an outcome of specialisation. As Emmanuel (1972) puts it: “I distinguished between two forms of nonequivalence. One (apparent) form arises from the mere transformation of values into prices of production, when wage rates are the same but the organic compositions of capital are different. The other, which I called nonequivalence in the strict sense, is characterized by differences in both wages and organic compositions.”

As a matter of fact, the classical model of international trade – summarised by Nagyová & Čiderová (2020) on the basis of Krugman et al., 2018; Staněk et al., 2018; Baláž et al., 2019 – is besides the simple labour theory of value characterised among others by inland production factor mobility and by the fact that inventions are disregarded.

Still, the theory of the division of labour was behind the so-called *Taylorism* and *Fordism* as well-known management systems. The former, inspired by A. Smith and invented by F. W. Taylor around 1880, operated on the basis of „double division of labour“ (i.e. vertical & horizontal division of labour); the latter scientific organization of work even introduced an assembly line into H. Ford’s automotive assembly plants in 1914. Speaking of 20<sup>th</sup> century, in

his *The Great Hope of the 20<sup>th</sup> Century* (1949) J. Fourastié deals with technological modernization and migration of jobs to new sectors. “For a car, for example, it took months to manufacture in the years following its invention in the 19<sup>th</sup> century. In the middle of the 20<sup>th</sup> century, several vehicles came out of the same factory every day. The 20<sup>th</sup> century car is cheaper in real price than it was in the 19<sup>th</sup> century.” (Rébillard, 2019a). Technical costs of production are in the core of P. Sraffa’s new theory of value inspired by D. Ricardo. According to P. Sraffa’s model (*The Production of Commodities by Means of Commodities*, 1960) the economy symbolizes a circular process rather than a set of bilateral exchanges between producers and consumers: commodities enter into the production of other goods; all goods need to be produced in sufficient quantity for the production process; a “surplus” is the outcome. P. Sraffa then wonders how to distribute such “surplus” – *“In remuneration by wages, for the workers, or in profit, for the owners of capital? It shows that this distribution is the subject of a conflict. Because wages and profits are two inversely proportional variables (what goes to one cannot go to the other) that can only be defined politically.”* (Fondu, 2019b). In this regard, let us point out a number of related diverging viewpoints:

- On one hand, J. K. Galbraith identifies large enterprises (e.g. Ford), trade unions and the interventionist state as three great “countervailing powers” (Blin, 2019); alternatively, the International Labour Organization (ILO) maintains that although governments and employers’ and employees’ organizations may have differing opinions on some occasions, social dialogue reflects a shared interest in the prosperity of enterprises just like the wellbeing of employees, and it provides policymakers with important input for an effective policy design. For instance, variance (ranging from 10 to more than 100) in the number of hours of labour that was necessary to purchase a nano ipod in European and Asian context is illustrated by Fig. A1 in Annex.
- On the other hand, employers “will be attracted by the low cost of labour practiced in emerging countries and, to remain competitive, will prefer to relocate production. This is how opening up to international trade is detrimental to part of the population of developed countries” (Gallois, 2019a).
- On one hand, H. B. Grubel & A. D. Scott (1966) conclude that in the short run emigration of highly skilled persons (brain drain) is likely to cause economic losses until replacements for emigrants can be trained, but long-run losses in a market economy are, in their opinion, likely to be small and are primarily associated with externalities as well as with elements of income redistribution. On the other hand, J. Bhagwati (1976) noted that *“there is a sizeable segment of academic opinion and writing on the subject of the brain drain that does not share the view that the brain drain phenomenon is also a brain drain problem. Much of this type of viewpoint originates from the academics of the developed countries, and is to be traced partly to the way in which the welfare consequences of the brain drain are viewed by the analyst and partly to the fact that most of the academics belong to the class of professionals who move across countries and are therefore more prone to see the advantages of scientific mobility rather than the handicaps that it may impose on the countries of emigration in achieving their economic, social and political objectives.”*
- On one hand, G. Becker frames “human capital” as the set of productive capacities such as general or specific knowledge and know-how that an individual accumulates throughout own life (Gallois, 2019b). On the other hand, Th. Piketty argues that “it is better to be an annuitant and own capital (a building from which rents would be drawn, for example) than to be an employee and rent one’s labour force, because income from capital (here, rents) increases more quickly than wages” (Rébillard, 2019b).



To illustrate the theoretical background above, we will now – in the context of a series of industrial revolutions – turn to related data as illustrated by Carroué (2021). In fact, industrial production has grown by 46% over the past ten years, with the following three characteristics: 82% of all world production are provided by Asia; 70% of the value of industrial production falls on 10 countries and 83% on 20 countries. The trend of delocalisation has shifted production especially in the textile, automotive and electrotechnical industries: in Europe e.g. to Poland, the Slovak Republic, and Romania; and in South-East Asia e.g. to Vietnam, the Philippines, and Thailand. Speaking of the automotive industry, automobiles have become a symbol of mass production (as explained earlier) as well as mobility (which is abstracted in the classical model of international trade) since the beginning of the 20th century. Similarly to overall industrial production, 78% of world automotive production fall on 10 countries and 87% on 15 countries. Car production grew by 73% worldwide between 2000-2018, and even though in practice the volume of production in Europe remained unchanged, European share of world production fell to almost a half (from 40% to 23%); conversely, the world production share of one-third previously corresponding with Asia now falls on P.R.China alone, so the share of Asia now stands at almost a double (62%). Also, Asian companies are interested in becoming shareholders as can be seen in the case of the Chinese enterprise Dongfeng with regard to Peugeot; the Chinese enterprise Geely with regard to Volvo; or the Indian enterprise Tata with regard to Jaguar and Land Rover.

Needless to say, the temporal and spatial aspects of all theoretical frameworks as well as data are not to be ignored. This is why we consider operation of the “invisible hand” within the so-called Single Market of the EU27 (as an advanced degree of integration in terms of Balassa’s theory of economic integration, 1961), on one hand; and in the region of ASEAN as another form of regional economic integration, on the other hand. At this point we move to *Part 3 Methodology*, which rests on the notion of the (im)perfect operation of the “invisible hand” explained by A. Smith in the famous quote: *“It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest.”* (Smith, 1776).

### 3 METHODOLOGY

In the opening of *Part 3 Methodology* let us shortly remind A. Smith’s claim concerning the division of labour (*“Labour, therefore, is the real measure of the exchangeable value of all commodities.”*), which he further developed into the following consideration: *“But though labour be the real measure of the exchangeable value of all commodities, it is not that by which their value is commonly estimated. It is often difficult to ascertain the proportion between two different quantities of labour. The time spent in two different sorts of work will not always alone determine this proportion. The different degrees of hardship endured, and of ingenuity exercised, must likewise be taken into account. There may be more labour in an hour’s hard work than in two hours easy business; or in an hour’s application to a trade which it cost ten years labour to learn, than in a month’s industry at an ordinary and obvious employment. But it is not easy to find any accurate measure either of hardship or ingenuity.”* (Smith, 1776).

In general, wages are commonly perceived as a synonym for **(gross)** earnings or **(gross)** remuneration – i.e. total remuneration in cash and in kind paid to employees before any deductions are made by the employer in respect of taxes, contributions of employees to social security and pension schemes, life insurance premiums, union dues or other obligations of employees as defined by the ILO. In *Part 2 Theoretical background/Literature review* we referred to unit labour requirements in wine production (LW) or unit labour requirements in

cloth production (LC) – technically, minimum wages mostly tend to be set in practice for an hour/a day/a week/a month of work, etc. Bearing in mind that the official definition of minimum wage will open *Part 4 Results*, let us now present a summary describing a minimum wage as **the minimum amount of remuneration, which is paid for performed work, is related to certain period and cannot be reduced either by a collective agreement, or by an individual contract. When we take this** summary as a benchmark, then minimum wages feature in more than 90% of ILO member states.

Minimum wage indicated in this paper corresponds to gross minimum wage, i.e. it is not to be mixed up with “disposable take-home pay, which is what remains after taxes, pensions, social security contributions, or other deductions” (ILO). **As we informed in *Part 2 Theoretical background/Literature review***, we consider the post-Brexit European Union (EU27) with its advanced degree of integration in terms of Balassa’s theory of economic integration (1961) as a role model for other forms of regional economic integration such as the ASEAN region: Austria, Denmark, Finland, Italy, Sweden (EU27), Brunei as well as Singapore (ASEAN10) do not feature a minimum wage, the UK registers an hourly minimum wage. This is the reason why the “non-minimum-wage-EU5” and the “non-minimum-wage-ASEAN2” were not included in our analysis. On the contrary, the ASEAN region was for the purpose of data comparability covered in both interregional formats: ASEAN10+3 (e.g. hourly minimum wage in Japan) and ASEAN10+6 (e.g. hourly minimum wage in New Zealand). Data on minimum wages of individual countries were sourced from the ILO report (2020) and the World Bank (2022). In line with Fig. A2 in Annex illustrating developments between 2000-2018 and for comparability in the pre-COVID-19 phase we analysed 2019 data on minimum wages; the 2015-2018 data on minimum wages were also covered to document the trend of minimum wages in the pre-COVID-19 phase. The respective 2019 bilateral EUR exchange rates provided by the European Central Bank and Banka Slovenije were applied in the case of minimum wages expressed in currencies (of the UK, the post-Brexit European Union, and the ASEAN region) other than EUR. Data on minimum wages in the post-Brexit European Union relate to a month of work (Tab. 5), in the case of the Slovak Republic specifically to a month of work and/or an hour of work (Tab. 5 and 7-8). Data on minimum wages in the ASEAN region (with the exception of Australia and its weekly minimum wage, which was not included) are sorted in the categories of a month/a day/an hour of work (Tab. 6).

## 4 RESULTS

*"Minimum wage may be understood to mean the minimum sum payable to a worker for work performed or services rendered, within a given period, whether calculated on the basis of time or output, which may not be reduced either by individual or collective agreement, which is guaranteed by law and which may be fixed in such a way as to cover the minimum needs of the worker and his or her family, in the light of national economic and social conditions."*

International Labour Office. (1992). *Minimum wages: wage-fixing machinery, application and supervision. Report III (Part 4B)*. Geneva, 79<sup>th</sup> Session of the International Labour Conference.

Tab. 5 documents ranking in the post-Brexit European Union based on the 2019 monthly minimum wage and the share of the EU22 average (the “non-minimum-wage-EU5” is abstracted), sorted from the lowest to the highest minimum wage. While the highest 2019 monthly minimum wage in the EU22 was in Luxembourg (2,090 EUR and 231% of the 2019 EU22 average), at the opposite end was the 2019 monthly minimum wage of 286 EUR (32% of the 2019 EU22 average) in Bulgaria. This means that the case of the ever closer European (minimum wage) Union is, *ceteris paribus*, exemplified by the 2019 interval from 286 EUR

(Bulgaria) to 2,090 EUR (Luxembourg), where the 2019 monthly minimum wage in Bulgaria equals 14% of the 2019 monthly minimum wage in Luxembourg, and the 2019 monthly minimum wage in Luxembourg stands at 731% of **the** 2019 monthly minimum wage in Bulgaria. Some parallel may be identified between the monthly minimum wage in Bulgaria and in the Slovak Republic. In absolute terms, the 2015 monthly minimum wage in Bulgaria and in the Slovak Republic stood at 380 (380 BGN in Bulgaria and 380 EUR in the Slovak Republic). By 2019 the monthly minimum wage in absolute terms has reached the level of 560 BGN in Bulgaria and of 520 EUR in the Slovak Republic. As, however, the 2019 monthly minimum wage of 560 BGN in Bulgaria symbolized the value of 286 EUR, in relative terms the discrepancy is related also to the fact that unlike the Slovak Republic, Bulgaria has not become member of the Euro Area yet.

Cyprus is the only post-Brexit European Union member in the EU22 average sample, which registered the same amount of monthly minimum wage between 2015-2019. In 2019 specifically, the monthly minimum wage of 870 EUR in Cyprus nearly matched the value of the EU22 average (96% of the 2019 EU22 average). Despite the fact that in absolute terms the monthly minimum wage in Cyprus remained constant between 2015-2019, the situation is different in relative terms.

Likewise in 2019, the Slovak Republic had a monthly minimum wage of 520 EUR (in absolute terms matching the one registered in 2019 in the Czech Republic; in relative terms matching the 2019 monthly minimum wages in the Czech Republic as well as in Poland) and another reference point is the 2019 EU22 average in the amount of 903 EUR. Then, **the** 2019 monthly minimum wage in the Slovak Republic equals 58% of the EU22 average, and the EU22 average stands at 174% of **the** 2019 monthly minimum wage in the Slovak Republic.

Similarly, Tab. 6 shows the ranking of the ASEAN region in both interregional formats: ASEAN10+3 and ASEAN10+6. Unavailability of data for the “non-minimum-wage-ASEAN2” (Brunei, Singapore) is combined with variability of available data on minimum wages. As we indicated in *Part 3 Methodology*, Tab. 6 sorts data on minimum wages in the ASEAN region (with the exception of Australia and its weekly minimum wage, which was not included) in the categories of a month/a day/an hour of work.

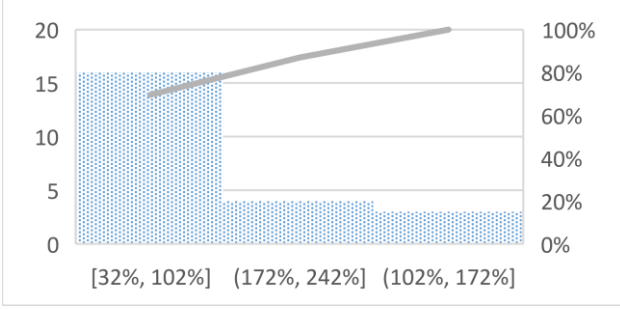
Firstly, in the ASEAN10+3 sample (2019 monthly minimum wage) we see that Indonesia (ASEAN10), Vietnam (ASEAN10), Laos (ASEAN10), Cambodia (ASEAN10), P.R.China (ASEAN10+3), Malaysia (ASEAN10), South Korea (ASEAN10+3) – alike the EU22 – register monthly minimum wages. In the ASEAN10+3 sample (2019 monthly minimum wage) the bottom interval starts at 99 EUR, the average is 322 EUR, and South Korea with 1,337 EUR is by far the one with the highest monthly minimum wage.

Secondly, in the ASEAN10+6 sample (2019 daily minimum wage) the interval spreads from 2 EUR/day (India) to 9 EUR/day (Thailand), and the Philippines match the ASEAN10+6 sample average of 5 EUR/day.

Thirdly, in the ASEAN10+6 sample (2019 hourly minimum wage) the minimum wage of 6 EUR/hour in Japan and the minimum wage of 10 EUR/hour in New Zealand result in the ASEAN10+6 sample average of 8 EUR/hour.

Tab. 5 – Trends of minimum wage (EUR) in the EU22 and minimum wage (2019) as a % of EU22 average.

Source: Authors' calculations based on International Labour Organization (2020), European Central Bank (2022) & World Bank (2022).



			<b>Trend of minimum wage (2015-2019)</b>	<b>Minimum wage (2019)</b>	<b>Minimum wage as proportion of EU22 average (2019)</b>
			(Column A)	(Column B)	(Column B/ EU22 average)
Bulgaria	EUR	Monthly	↑	286	32%
Latvia	EUR	Monthly	↑	430	48%
Romania	EUR	Monthly	↑	438	49%
Hungary	EUR	Monthly	↑	458	51%
Croatia	EUR	Monthly	↑	506	56%
Slovak Rep.	EUR	Monthly	↑	520	58%
Czech Rep.	EUR	Monthly	↑	520	58%
Poland	EUR	Monthly	↑	524	58%
Estonia	EUR	Monthly	↑	540	60%
Lithuania	EUR	Monthly	↑	555	62%
Portugal	EUR	Monthly	↑	700	78%
Greece	EUR	Monthly	↑	758	84%
Malta	EUR	Monthly	↑	762	84%
Cyprus	EUR	Monthly	→	870	96%
Slovenia	EUR	Monthly	↑	887	98%
<b>EU22 Average</b>	<b>EUR</b>	<b>Monthly</b>	<b>n.a.</b>	<b>903</b>	<b>100.00%</b>
Spain	EUR	Monthly	↑	1,050	116%
France	EUR	Monthly	↑	1,521	168%
Germany	EUR	Monthly	↑	1,557	172%
Belgium	EUR	Monthly	↑	1,594	177%
the Netherlands	EUR	Monthly	↑	1,636	181%
Ireland	EUR	Monthly	↑	1,656	183%
Luxembourg	EUR	Monthly	↑	2,090	231%

Legend:

EU22: Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain;

EU27: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden.

Tab. 6 – Trends of minimum wage (EUR) in the ASEAN region and minimum wage (2019) as a % of the ASEAN region average. Source: Authors' calculations based on International Labour Organization (2020), European Central Bank (2022), Banka Slovenije (2022) & World Bank (2022).

			Trend of minimum wage (2015-2019)	Minimum wage (2019)	Minimum wage as proportion of ASEAN10+ sample average (2019)
			(Column A)	(Column B)	(Column B/ ASEAN10+ average)
<b>ASEAN10+3 sample (Monthly wage)</b>					
Indonesia	EUR	Monthly	↑	99	31%
Vietnam	EUR	Monthly	↑	112	35%
Laos	EUR	Monthly	↑	113	35%
Cambodia	EUR	Monthly	↑	163	51%
P.R.China	EUR	Monthly	↑	194	60%
Malaysia	EUR	Monthly	↑	237	74%
<b>ASEAN10+3 sample (Monthly) Average</b>	<b>EUR</b>	<b>Monthly</b>	<b>n.a.</b>	<b>322</b>	<b>100.00%</b>
South Korea	EUR	Monthly	↑	1,337	415%
<b>ASEAN10+6 sample (Daily wage)</b>					
India	EUR	Daily	↑	2	40%
Myanmar	EUR	Daily	↑	3	60%
Philippines	EUR	Daily	↑	5	100%
<b>ASEAN10+6 sample (Daily) Average</b>	<b>EUR</b>	<b>Daily</b>	<b>n.a.</b>	<b>5</b>	<b>100.00%</b>
Thailand	EUR	Daily	↑	9	180%
<b>ASEAN10+6 sample (Hourly wage)</b>					
Japan	EUR	Hourly	↑	6	75%

<b>ASEAN10+6 sample (Hourly Average)</b>	<b>EUR</b>	<b>Hourly</b>	<b>n.a.</b>	<b>8</b>	<b>100.00%</b>
New Zealand	EUR	Hourly	↑	10	125%

Legend:

ASEAN10: Brunei; Cambodia; Indonesia; Laos; Malaysia; Myanmar; Philippines; Singapore; Thailand; Vietnam;

ASEAN10+3: Brunei; Cambodia; P.R.China; Indonesia; Japan; Laos; Malaysia; Myanmar; Philippines; Singapore; South Korea; Thailand; Vietnam;

ASEAN10+6: Australia; Brunei; Cambodia; P.R.China; India; Indonesia; Japan; Laos; Malaysia; Myanmar; New Zealand; Philippines; Singapore; South Korea; Thailand; Vietnam.

(International) labour and capital mobility have traditionally interacted as “pull” factors. With reference to Fig. A2 in Annex illustrating developments in the automotive industry across the world between 2000-2018, the Slovak Republic as a world leader in car production per capita will register further growth of the current 48% share of the automotive industry on its total industrial production (SARIO, 2022) and possibly also (international) labour mobility with the new Volvo assembly plant (Volvo Cars, 2022). *Ceteris paribus*, we take the universal national minimum wage and the respective automotive industry headquarters (i.e. countries of “origin” rather than countries of all assembly plants such as the Volvo Cars plants in Belgium, P.R.China, Sweden and USA, or countries of shareholders) as a point of reference in Tab. 7-8.

Tab. 7 – Minimum wage (2019, EUR) in the Slovak Republic and in the countries of “origin” of automotive assembly plants (to be) operating in the Slovak Republic. Source: Annual Reports, ILO (2020), European Central Bank (2022), Banka Slovenije (2022), World Bank (2022) & SARIO (2022).

Automotive industry assembly plants (to be) operating in the Slovak Republic	Automotive industry headquarters (HQ)	Minimum wage (2019, EUR)	
		Country of HQ	Slovak Republic
Volkswagen	Wolfsburg, Germany	1,557 (monthly)	520 (monthly)
Stellantis	Hoofddorp, the Netherlands	1,636 (monthly)	520 (monthly)
Kia	Seoul, South Korea	1,337 (monthly)	520 (monthly)
Jaguar Land Rover	Whitley, Coventry, UK	9.36 (hourly)	2.989 (hourly)
Volvo	Gothenburg, Sweden	n.a.	

**The 2019 monthly minimum wage in the Netherlands of 1,636 EUR (181% of the EU22 average) is bigger both than the ones of 1,557 EUR (172% of the EU22 average) in Germany and of 1,337 EUR (415% of the ASEAN10+3 sample average) in South Korea.**

Tab. 8 – Comparison of minimum wage (2019, EUR) in the Slovak Republic and in the countries of “origin” of automotive assembly plants operating in the Slovak Republic. Source: Authors’ calculations based on ILO (2020), European Central Bank (2022), Banka Slovenije (2022) & World Bank (2022).

Car producer	Minimum wage (EUR)	SK/Country of HQ	Country of HQ/SK
Volkswagen	(monthly)	520/1,557	33% 1,557/520 299%

Stellantis	(monthly)	520/1,636	32%	1,636/520	315%
Kia	(monthly)	520/1,337	39%	1,337/520	257%
Jaguar Land Rover	(hourly)	2.989/9.36	32%	9.36/2.989	313%

**In the Slovak Republic the 2019 monthly minimum wage of 520 EUR was in the interval from 32% (Stellantis) to 39% (Kia) of the 2019 monthly minimum wages registered in the countries of “origin” of automotive assembly plants operating in the Slovak Republic. The 2019 SK hourly minimum wage of 2.989 EUR amounted to 32% of the UK equivalent, and the 2019 minimum wages registered in the countries of “origin” of both Stellantis and Jaguar Land Rover symbolised more than 300% of the respective 2019 SK minimum wage equivalent.**

## 5 DISCUSSION

B. Balassa (*The Theory of Economic Integration*, 1961) categorised individual degrees of economic integration (*a free-trade area, a customs union, a common market, an economic union, and complete economic integration*) as upgrades of each previous form. In *Part 2 Theoretical background/Literature review* we indicated that in our paper we consider the context of the EU27 with its advanced degree of integration in terms of Balassa’s theory of economic integration (1961) as a role model for other forms of regional economic integration such as the ASEAN region (Tab. 9).

Tab. 9 – Chronology and development of economic integration in the EU27 and ASEAN10.

Source: ASEAN (2022) & European Union (2022a).

<b>Regional forms of integration:</b>	<b>Europe-wide</b>	<b>Asia-wide</b>
	<b>EU27</b>	<b>ASEAN10</b>
<b>Origins of integration</b>	1951/1957	1967
<b>Deepening and widening in terms of Balassa’s theory of economic integration:</b>		
<b>Free trade area</b>	1968	1992
<b>Customs union</b>	1968	-
<b>Common market</b>	1993	-
<b>Economic union</b>	1990+	-
<b>Interregional formats:</b>	<b>Europe-wide</b>	<b>Asia-wide</b>
	<b>EEA30</b> (European Economic Area): EU27, Iceland, Liechtenstein, Norway	<b>ASEAN10+6:</b> ASEAN10, Australia, P.R.China, India, Japan, New Zealand, South Korea

In comparison with ASEAN as *a free-trade area* (where tariffs and quantitative restrictions between the participating countries are abolished, but each country retains its own tariffs against non-members), the EU27 has transformed from *a customs union* (with equalisation of tariffs in trade with non-member countries besides the suppression of discrimination in the field of commodity movements within the union) through *a common market* (with not only trade restrictions but also restrictions on factor movements abolished) to the current *economic union*

(combining the suppression of restrictions on commodity and factor policies in order to remove discrimination that was due to disparities in these policies). Within the economic union certain competences are either exclusive on the EU27 level or shared between the EU27 level and individual EU27 member states; in a number of areas competences of EU27 member states are supported on the EU27 level. In this respect we would like to highlight that our focus on the Global Competitiveness Index (the GCI) in a spectrum of territorial and temporal perspectives related to the European Union was covered by a series of analyses published between 2012 and 2014 (Čiderová & Repášová, 2012; Čiderová et al., 2013; Čiderová & Drobková, 2013; Čiderová & Kovačević, 2013; Čiderová & Majerníková, 2013; Čiderová & Šimorová, 2013; Čiderová & Šeptaková, 2014; Čiderová & Štubniak, 2014). In a comprehensive manner the concept as well as the methodology of the GCI (by the World Economic Forum – WEF) was addressed by Zábajník et al. (2020).

It can be stated that lower degrees of economic integration (*a free-trade area; a customs union*) refer to the concept of the international division of labour in terms of international trade (A. Smith; D. Ricardo; B. Ohlin & E. F. Heckscher; P. Samuelson; A. Emmanuel), while upper degrees of economic integration (*a common market; an economic union*) relate to the concept of the international division of labour in terms of human capital and its remuneration (J. Fourastié; P. Sraffa; J. K. Galbraith; G. Becker; Th. Piketty). In the framework of specific circumstances and policy objectives of each country ILO recommends to keep minimum wages “as complex as necessary but as simple as possible”, and to prevent wage differentiation between different groups of employees which would not be based on legitimate reasons (e.g. educational objectives, work experience, skills) – this also corresponds with the principle of non-discrimination applied within the EU27 Single Market. ***“To maintain their relevance, minimum wage levels need to be adjusted from time to time. Failure to do so may lead to an erosion of the purchasing power of workers who earn the minimum when prices of goods and services are rising, or may lead to more wage inequality when the general level of wages is increasing,”*** ILO adds. Two weeks after the announcement of a new Volvo assembly plant to be operating in the Slovak Republic, a historic agreement between labour unions and employers in the Slovak Republic on the monthly minimum wage of 700 EUR for the year 2023 was reached (Euractiv, 2022).

This news arrives in the era of the Fourth Industrial Revolution, which is associated with the so-called technology tipping points as moments when individual technological shifts become relevant to mainstream society. Even though the 2015 World Economic Forum expert survey covered 21 technology tipping points, for the purpose of relevance we selected the following three, with their positive and negative impact indicated in Tab. 10 below:

- The “*3D Printing and Manufacturing*” *technology tipping point* means that the first 3D-printed car would be in production on average by 2022;
- “*The Sharing Economy*” *technology tipping point* represents that there would be globally more trips/journeys via car sharing than in private cars on average by 2025;
- The “*Driverless Cars*” *technology tipping point* means that driverless cars would stand for 10% of all cars on roads in the USA on average by 2026.

Tab. 10 – Technology tipping points related to mobility. Source: Schwab (2017).

Technology tipping points/shifts	Impact	
	Positive	Negative
“ <i>3D Printing and Manufacturing</i> ”	Traditional mass manufacturing responding to the challenge by	Job losses in a disrupted industry



	finding ways to reduce costs and the size of minimum runs	
“ <i>The Sharing Economy</i> ”	Creation of secondary economies (Uber drivers delivering goods or food)	More contract/task-based labour (versus typically more stable long-term employment)
“ <i>Driverless Cars</i> ”	Improved mobility for some groups of population	Job losses (taxi and truck drivers, car industry)

Building on *Part 2 Theoretical background/Literature review* with focus on the concept of the international division of labour in terms of international trade as well as in terms of human capital and its remuneration, in *Part 3 Methodology* we applied international division of labour to the concept of minimum wage. Subsequently, we calculated and presented data on minimum wages in a (macro)regional (EU; ASEAN) and an interregional (EU & ASEAN) perspective in *Part 4 Results* before interpreting data related to the uplifting recent minimum wage developments in the Slovak economy in a comparative perspective in the EU/non-EU and Fourth Industrial Revolution context in *Part 5 Discussion*. The Single Market of the EU27 is where our focus moves next.

## 6 CONCLUSION

*“Where countries once traded in primary commodities, or simple finished goods, that were produced close to where they would be consumed, the coming of cheaper technology and transportation enabled fragmented global supply chains in which multinational firms from developed countries outsourced certain production functions to developing and emerging economies (Dewan & Suedekum, 2017). This form of offshoring has been an important source of employment and growth for many countries where it has capitalized on the availability of surplus, low-cost labour. However, fragmented production chains and complex supplier networks have also had negative implications for decent working conditions, something that the ILO, governments and social partners have been working hard to rectify.”*

International Labour Organization. (2022). *World Employment and Social Outlook: Trends 2022*. Geneva: International Labour Office.

Throughout history the mankind has voluntarily and involuntarily moved between continents, distant lands, or even neighbouring regions in the pursuit of life-course ambitions, crossing natural obstacles just like cultural and political borders; proper comprehension and coverage of human mobility, therefore, necessitates a holistic perspective. In *Part 2 Theoretical background/Literature review* we streamlined our focus into two main thematic areas: the domain of international trade resting on the logic of specialised division of labour; and the issue of human capital. Despite the fact that migration (particularly labour migration) has fuelled globalisation in the 21<sup>st</sup> century, countries have not necessarily translated it into effective migration and integration policies due to a clash with the call for protection of employment and social cohesion among their citizens. Transnationalism has the potential of multiplication of ties and links across borders; still, ongoing tensions divide the needs of (labour) markets in home and host countries, the strategies of (labour) migrants, and the politics of immigration around the world (and the EU in particular).

In introduction to this paper we have already indicated that as a matter of fact economic and moral positions have been as often complementary as competing. Wages depending basically on labour supply and demand is what M. C. Branco (2019) refers to as the “mainstream view” in his article “*Economics for the right to work*” published in the prestigious ILO *International*

*Labour Review*, and he continues: “*In the language of mainstream economics, therefore, wages remunerate the performance of a task and depend on how productive that performance is. In the language of the human right to work, by contrast, wages, and especially minimum wages, are primarily seen as the income needed to satisfy the needs of workers and their families, irrespective of performance.*”. In the context of minimum wages ILO itself maintains that **minimum wages should in principle afford adequate protection to all workers (incl. migrant workers and youth) in an employment relationship regardless of their contractual arrangements (incl. workers on fixed-term contracts and other forms of temporary work, temporary agency work and other contractual arrangements involving multiple parties, or part-time work).**

If the “geography of work” reflects the simultaneous brain drain by and large westwards and offshoring by and large eastwards particularly in the pre-COVID-19 phase, than the “changing geography of work” increasingly reflects the (post-)COVID-19 phase characterised by nearshoring, reshoring and the so-called digital nomadism.

Now, in the environment of fragmented supply chains spread over multiple countries, the COVID-19 pandemic brought about a turn from the efficiency-oriented “just-in-time” to the so-called “just-in-case” system of sourcing, and the trend of *nearshoring* (i.e. offshoring production to locations closer to end customer, including new consumers in emerging markets) is complemented with *reshoring* (i.e. reversed offshoring of production back to domestic production, especially in manufacturing). Still, reshoring does not automatically generate employment that would match the pre-offshoring levels of employment. With the Fourth Industrial Revolution, a wide range of jobs are “*at risk of automation, far greater than in previous industrial revolutions – and rapid scaling means the job losses could accumulate quickly. Meanwhile, the rate of job creation in industries at the technological frontier is slower today than in previous decades,*” Schwab (2018) points out, adding: “*In advanced economies, the majority of new jobs consist of independent contracting, part time, temporary or “gig” economy activities, which tend to lack the statutory protections and social benefits of full-time work.*”.

In the contemporary globalised world the so-called (technology-enabled) digital nomadism is not necessarily viewed as (invisible) “migration leakage” (term applied by Stark, 2004) as such, but what remains on the agenda of institutions such as the ILO and the EU27 are the terms of employment (in terms of the need for and effects of international labour standards). “Setting and adjusting the level is perhaps the most challenging part of minimum wage fixing,” ILO claims: on one hand, if set too low, minimum wages may not necessarily motivate employees; on the other hand, if set too high, minimum wages may not necessarily motivate employers.

In its Presidency Programme (1 January 2022 – 30 June 2022), the French Presidency of the Council of the European Union listed a (European) minimum wage among its priorities (2021), and the European Commission signaled in its 2022 Work Programme titled *Making Europe stronger together* its intention to propose “a Recommendation on minimum income to support the policies of Member States” (European Commission, 2021). Associated effects may be identified in three possible dimensions.

Firstly, in the environment of the EU27 Single Market as a common market (Balassa, 1961), the argument is that adequate minimum wages benefit both employees and employers based on the logic that when set at adequate levels, minimum wages strengthen incentives to work and sustain domestic demand. This is well documented by the case of the historic agreement between labour unions and employers in the Slovak Republic on the monthly minimum wage of 700 EUR for the year 2023.

Secondly, in the environment of the EU27 Single Market as an economic union (Balassa, 1961), by contributing to a decent standard of living, protection of income of disadvantaged groups of population and reduction of in-work poverty adequate minimum wages benefit the economy.

Thirdly, in the interregional EEA30 format developments regarding minimum wages within the EU27 Single Market may be of relevance also for Iceland, Liechtenstein, and Norway, so there is room for further research by extending the focus to Iceland, Liechtenstein, and Norway, too.

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**7 ANNEX**



Fig. A1 – Comparison of the number of hours of labour necessary to purchase a nano ipod in European and Asian context. Source: Harbulot, 2011.

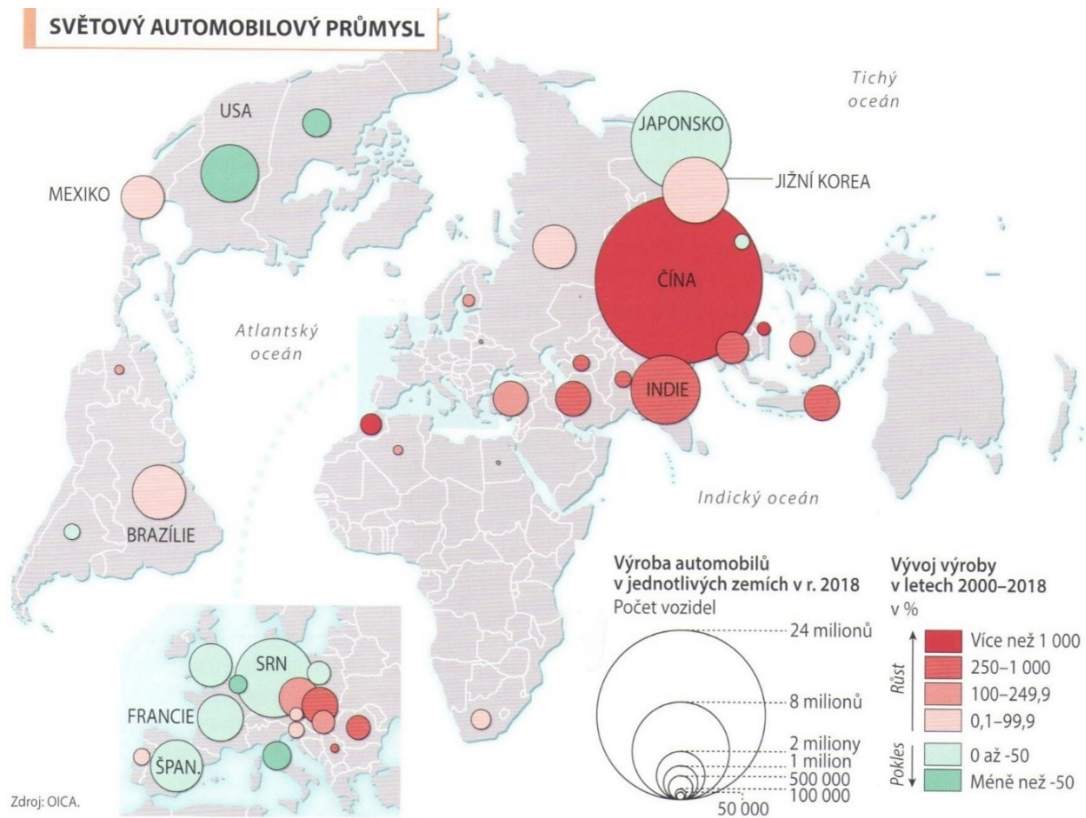


Fig. A2 – Developments in the automotive industry across the world (2000-2018). Source: Carroué, 2021.

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# URBAN CIRCULAR CITY SYSTEM ACROSS CAPITAL V4

*Michal Vávra, Lenka Zemanová*

## **Abstract**

The circular economic system is looking on urban infrastructure activities for the application of emerging challenges, taking into account the need for sustainability and compliance with the Paris Climate Agreement. For this reason, the main goal of this contribution is the application of the perception of the circular economy in the field of architecture or urbanism concerning its environmental, economic, social or technological impact within the capitals of the V4 countries. To achieve the paper's primary goal, we used a wide range of scientific and professional literature or statistical portals. We subsequently processed these data using theoretical scientific empirical methods. To achieve this goal, we used research questions and hypotheses, which reveal the current state of green architecture and the perception of urban development in V4 countries. The results show that the highest number of green architecture is in Budapest, where up to 458 buildings are certified out of a total of 937 543 buildings. Following this, we determined the load of CO<sub>2</sub> emissions by buildings on the city system. The average value of CO<sub>2</sub> per building in V4 is 3.815 kg. At the same time, we also determined the average value of CO<sub>2</sub> load by buildings within cities, which is at the level of 63.5%. Warsaw at the level and up to 81% of the total CO<sub>2</sub> load on the city. After achieving the results of research questions and hypotheses, we explain the environmental, economic, social or technological impact on the capitals of the V4 countries.

**Keywords:** *sustainable architecture, urbanism, V4, circular economy, Smart City*

## **1 INTRODUCTION**

An aspect of the company's future development is adapting to the challenges and trends. We are currently facing one of the world's most critical environmental challenges. The Paris Climate Agreement of 2015 also responds to this challenge by trying to commit as many countries as possible to using renewable resources, reducing emissions and other externalities, and ensuring the transition from a linear economic system to a circular economic system. It is the provision of the transition to a circular economic system closely related to regional development in the given countries, concerning its application in sustainable parameters. One of the most significant formations of society using the circular economy is the use of this model within cities, as the cities themselves are socio-cultural centres of ideas, education, traditions, or typical features of the coexistence of a larger group of people. As a result, application to cities becomes a decisive factor in this group's current or future preferences. Globally, cities use around 1% of the country's area and are home to around 55% of the world's population (almost 75% of Europe's population). With increasing urbanization, the proportion of urban dwellers is expected to increase to 70% worldwide and 85% in Europe by 2050 (Byström, 2021). Cities account for about 85% of world GDP. At the same time, they consume approximately 70% of the world's sources and 70% of all energy produced. In addition, they emit 70% of all greenhouse gases and generate about 50% of all waste. As a result, many cities suffer from what might be called linear externalities, such as emissions to air and water, noise, thickening, and congestion itself (Byström, 2021). At the same time, 47% of emissions in cities or municipalities are existing buildings. On closer inspection, the daily activities carried out within buildings generate 27% of the emissions, with the balance being the materials used (11%, iron 10% and aluminium 2%) (architecture 2030, 2021). The primary benefit of a sustainable

building is its reputation, which as a direct result, can increase the price by up to 38%; an average reduction in energy prices by 15%; a reduction in emissions by 13%; a reduction in the need for subsequent repairs by 11%. The European Commission is dealing with the investigated situation within its Nearly zero-emission building (NZEB) program, where buildings with a low energy demand, high efficiency are perceived, and to cover the need, energy from renewable sources is used to a large extent. At the same time, the goal is to move to the ZEB (zero-emission building) level, which, based on the European Commission's regulation from December 2021, will apply from January, 2030 to all new buildings and from January, 2027 to all new buildings occupied or owned by public authorities' power, as well as for all new buildings with a usable area of more than 2000 m<sup>2</sup> (European Commission, 2021b).

This paper aims to apply the perception of the circular economy in architecture concerning its environmental, economic, social or technological impact within the capitals of the V4 countries. In Europe alone, over 75% of buildings are environmentally inefficient, assuming that 85-95% of the current buildings will be in Europe by 2050 (European Commission, 2021a). To achieve the goal, the authors will analyze appropriately selected professional literature and statistical portals and mathematically evaluate the impact on the V4 capitals in terms of externalities produced compared by traditional buildings. To fulfil the paper's primary goal, we will study our above-mentioned hypothesis and research question, which will help us characterize the ecological, economic, social, or technological impact of green architecture and urbanism in the environment of Visegrad capitals.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

The current sustainability of a city often depends on its architecture. Therefore, standards must be raised and tightened cumulatively while simultaneously meeting the current and anticipated challenges of ensuring sustainability within existing buildings. During the rebirth of already built buildings, the so-called Green buildings must adhere to strict standards that assess the sustainability status of such a building. Among the most used metrics, we include the metrics LEED (Leadership in Energy and Environmental Design), BREEAM (Building Research Establishment Environmental Assessment Method) and DGNB (Deutsche Gesellschaft für Nachhaltiges Bauen). LEED metrics are the most used of them and assess the sustainability of the building in terms of design, indoor climate, waste management, availability, services offered, in terms of materials used and its impact on the environment from a social, financial, cultural, but especially on environmental point of view (U.S. Green Building Council, 2022). From an age perspective, the oldest metric for assessing the sustainability of buildings is the BREEAM metric. This metric was created in 1990 and evaluates the use of energy, water, waste management, building design, materials and technologies used, building availability, or impact on the community from a social, financial, cultural, but primarily environmental perspective (Breeam, 2022). The DGNB metric was established in 2009, assessing the life cycle or the very focus of the project on a holistic approach. This metric is used mainly in Germany. To support these metrics, we also record the latest quality standard, ISO 37122, which draws attention to the quality of life in cities from the perception of the applicability of sustainable development.

Based on the knowledge and data from the SmartMarket Report 2021 study from the Dodge Construction Network, we can determine the environmental and economic differences between green and ordinary buildings. From the point of view of the economic spectrum, it is estimated in the European area within new green buildings, the decrease in average operating costs over the next 12 months by 8.6%, while in the 5-year cycle the savings increase to 13.2%. We can observe more savings in renovated or reprofiled green buildings, where the savings increase by

12.3% over the next 12 months. However, the savings will increase over the next five years to 17% (Dodge Construction Network, 2021).

From the point of view of the environmental spectrum within Europe, the following answers of the respondents regarding the importance of green buildings were recorded in the above-mentioned study:

- The protection of natural resources is significant for 69% of European respondents,
- CO2 reduction is significant for 76% of Europeans,
- Improving indoor air quality is very important for 70% of Europeans,
- Reducing energy consumption is very important for 79% of Europeans,
- Reducing water consumption is very important for 70% of Europeans.

In the current conception of Smart City policy perception, we note several types of applicability. Global trends in urban development are a highly sought-after topic in academia and the public sphere. We can perceive that all trends in the field of Smart City are closely related to achieving sustainability and thus the concept of the 2030 Agenda in European cities. Nevertheless, these trends are significantly applied in different regions of the world. Among the most prominent currently applied trends within cities and municipalities in the European Union, we can therefore include (Directorate-General for Parliamentary Research Services, 2021):

- Demographic change and inclusive growth,
- Applicability of circular economy,
- Intelligent provision of services by the city,
- Automation, digitization and technological progress,
- Climate crisis and its consequences.

Among the most significant current challenges in the field of cities is their most effective application to the urban economy of the entire urban complex. We also call Smart City applied trends to a specific city unit. We can define *Smart City* as a city which uses information and communication technologies to increase habitability, employment, and sustainability (European Commission, 2022). We can also define a Smart City based on the effective use of our position and the Resources that fulfil the lifestyle in the city and are sustainable towards their environment (Guerrero-Pérez et al., 2013). In general, we can summarize Smart City areas into six areas. We include here: smart economy, bright environment, innovative governance, smart housing, smart mobility, and intelligent people (Camero & Alba, 2019). Moirová et al. (2014) summarized the knowledge about modern Smart Cities based on their primary function into four separate categories.

The city often fulfils several current functions and thus acquires several perceptions according to the presented species. For this reason, when defining the economic function of the city, we record the liberal perception of the city from the point of view of gainful activity, both for natural and legal persons. Currently, the most highlighted feature focuses on the site's sustainability. This function is a direct application of the concept of circular economy, whether in public spaces, urbanism and architecture, waste management, material flows, mobility and many others. In many cases, this function ensures the arrival of new inhabitants in the cities and thus ensures its steady growth. Transparency is also a common feature of modern cities. They are ensuring administrative speed, reducing the necessary parameters for bureaucracy, as well as effective management and adopting new trends in the necessary legislation or regulations. In

terms of social function, modern cities are transformed into cities with an excellent social program for their current and future inhabitants. The very essence of Smart City is to streamline the process, a place with a social impact on the environment. With the poor efficiency of the given process, the city is constantly expanding, while investments in building infrastructure are regularly increasing. Increasing these costs resulted in many heterogeneous neighbourhoods with intense social and economic heterogeneity and spatial dystrophy (Bettencourt et al., 2007). This has a direct effect on spatial sociology. Importance of urbanism is responsible for addressing the issue of territorial development and settlement at all levels to environmental protection. In our conditions, sustainable urbanism is associated with the circular economy and, thus, in the most efficient use of raw materials with their subsequent possibility of reuse and the subsequent creation of systematic urban units. Urban units have a high degree of decentralization to natural resources while striving to achieve the area's high degree of self-sufficiency. To sum up, an urban technological system is created connected to the most significant urban civic systems with a low environmental burden (Farr, 2011).

We can perceive the traditional approach to the theoretical framework of territorial development using the *Territorial, Traditional and Market-Oriented Approach* (Vaňová, 2006). Using a territorial approach, we perceive the territory according to its positive and negative properties. The traditional approach is based on the urban use of the area with the harmonization of individual goals of interest groups. A last traditional approach is a market-oriented approach, which seeks to reconcile collective goals to increase the quality of life. The modern approach of an executive development area is its effectiveness within a circular economy. This efficiency is applied mainly through the sustainable development of the territory. In this concept, we focus on ensuring the renewal and viability of old city centres and enabling the growth and development of various new sustainable activities. In this case, it is necessary to perceive the effect of urban development inwards through the re-urbanization of inner-city residential zones (renewal of urban centres). By identifying precisely these challenges, it is possible to set such political decisions that will help mitigate the emerging potential threat in all other macroeconomic spheres. Despite the strong positive effects of digitization, the trend is also being misused to spread populism. It is growing populism that is becoming a dangerous tool in promoting ideas that have no scientific basis or are not rationally justified. This also reduces confidence in the city administration. Cooperation (horizontal, vertical, and cross-border) must be established to restore the overall state of cities. Adopting the ideas of the circular economy has taken the necessary step from a city perspective to mitigate the effects of the climate crisis. With an effective, but above all sustainable, way of managing cities, it is possible to create the necessary effect, which with its actions of the same quality but lower costs and secondary externalities, can achieve comparable results. The last major challenge is closely linked to demographic change. The set trend of migration, population ageing, or low birth rate causes negative consequences from spatial planning and associated urbanism. Unlike urban dwellers, cities are often no longer able to expand, therefore, a new plan is needed.

### **3 METHODOLOGY**

This paper's ambition is to apply the circular economy's perception in the field of architecture or urbanism concerning its environmental, economic, social or technological impact within the capitals of the V4 countries. To meet the primary goal of the work, we will use several high-quality scientific and professional literature, emphasising several statistical data from local statistical offices and annual or scientific-professional reports. Following this, we process the obtained data by several scientific general methods, which use the knowledge of logical thinking such as abstraction, analysis, synthesis, induction, deduction, comparison, or for the presentation of data and subsequently the evaluation method. To process the necessary

knowledge base, consisting of domestic and foreign sources, we used the abstraction method to single out the most critical facts. At the same time, we also used the methods of induction and deduction to exclude these facts. Using the method of analysis, we have identified the critical phenomena, which we have processed using the method of synthesis to determine the interrelationships between the various research areas. For a closer elaboration of the article, we subsequently compared the determined data for individual capitals of the V4 countries using the comparison method and determined the necessary deviations. Subsequently, these data were evaluated as one whole. Also, to achieve the paper's primary goal and the hypothesis, we processed the secondary data using a mathematical formulas.

*H1: Buildings in the V4 countries produce at least 50% of the total CO2 per city.*

To calculate and prove the hypothesis, we use the following logical mathematical formulas according to the authors of the article.

$$\frac{\text{produced CO2 by the city in MtCO2}}{\% \text{ share of CO2 per city from buildings}} \quad (1)$$

$$\frac{\text{buildings responsible for MtCO2 in the city}}{\sum \text{ number of buildings}} \quad (2)$$

In order to achieve the answer of our chosen hypothesis, it is necessary to condition it in order to obtain an answer to the following research questions:

*RQ1: What is the current state of green architecture within the capitals of the V4 countries?*

*RQ2: What urban development within the circular economy is recorded within the capitals of the V4?*

After answering chosen hypothesis and research questions, we will be able to fulfil the primary goal of this article and describe the environmental, ecological, social or technological impact within the capitals of the V4 countries. The output of the article will be the answers we found to the aspects of the circular economy with its impact on architecture and urbanism in the capitals of the V4 countries. At the same time, this article is part of the project Utilization of the perspective of circular economy as a strategic tool for developing capital cities in the V4 countries, which focuses on several parts of the forms of circular economy in the examined V4 capitals. By elaborating this paper and gaining the necessary knowledge of the authors, it stimulated him to subsequent deeper analysis of scientific literature and statistical data with a connection to the measurement of the circular economy in the capitals of the V4 countries. For better understanding, these statistics were graphically presented in tables and graphs. The paper contains seven tables, one graph and one formulas.

## 4 RESULTS

The V4 countries belong to the European Union; based on jointly established goals within the framework of strategic documents such as Agenda 2030, Horizon 2020 etc., and they strive to achieve the required measurable results as much as possible. It thus seeks to promote the circular economy in the private sector and within the public sector into public infrastructure. Therefore, it is very important to perceive that the need for a circular economy is closely linked to the architecture of buildings, both in terms of construction and renovation. The V4 countries are characterized by the fact that in the past, they belonged to the USSR countries, and many

real estates and buildings in the studied countries were built before the new millennium. Therefore the need for sustainable renovation has become an essential tool enshrined in many standards and regulations. In order to understand this issue, it will be necessary to answer the scientific methods we have chosen. Due to the conditionality of the methods to achieve the primary goal, the research questions will be answered first.

*RQ1: What is the current state of green architecture within the capitals of the V4 countries?*

### Bratislava

Bratislava, the capital of Slovakia, is currently the largest city of the country in terms of area and population. At the same time, it is also the economically most important city in the region. According to official sources, this city is specific for its agglomeration. About 430,000 people live in Bratislava, but more than 200,000 people come here daily for work opportunities. At the same time, it has a causal effect on urbanism as well as the architecture of the city. The current development of Bratislava is aided by its multiculturalism and vision to become a European city that follows current trends, but at the same time seeks to create its complementary advantage, which will become the appropriate identity of this city. Most often, it is with the help of sustainable elements which have also become established in architecture. In more detail, we can define these data from the area of sustainable buildings in Bratislava in Table 1.

Tab. 1 - Green buildings within Bratislava. Source: authors's own processing data taken from GBIG, 2022

City / Metrics	Certified	BREEAM Projects/Buildings	LEED Projects/Buildings	$\sum$ LEED m <sup>2</sup>
Bratislava	50	39	23	209217.6

In Table 1, we recorded the current state of certified green buildings within Bratislava. As we can see, the total number of certified green buildings within the LEED and BREEAM metrics is 44. Three buildings meet the highest level of the LEED (Platinum) metric - Einpark (2020) and Digital Park I, II (2015), III. (2016). Once again, the highest level of BREEAM Communities International at the Excellent level was won by the still-building Nové Nivy project. It is the Nové Nivy project that, when completed, will have a substantial environmental and social impact on the surrounding area. It should currently be one of 13 certificates of this type awarded at a given level, of which 11 are in the UK. To compare, only one project in Warsaw is certified, and one project is still under consideration in Budapest (Gubčo, 2020).

There are 40,108 buildings in Bratislava, of which 23,717 family houses, 9738 apartment buildings, 472 multifunctional buildings or 376 institutional/collective buildings (Statistical Office of the Slovak Republic, 2022). It is based on 0.09 per capita. All buildings or projects are multifunctional when concretizing green buildings in Bratislava, which meet the LEED and BREEAM certifications. Thus, we can say that out of the total number of 472, 50 are green buildings. Cumulatively, this represents 10.6% of the total number of multifunctional buildings.

### Prague

Prague dominates the region in terms of population (over 1.3 million inhabitants) and other socio-economic parameters. The most famous and economically most stable city in the Czech Republic is also their capital. At the same time, as a city, it creates the necessary aspects for the associated municipalities, which, as in the case of other cities, are changing the face of the region. Adapting to such demands from the point of view of urbanism or architecture creates the necessary challenges that meet several social, economic, technological, cultural and sustainable conditions. At present, according to the 2021 census, there are 108,146 buildings. Since 2011, there have been build 9620 buildings in Prague. There are 0.08 buildings per capita in Prague. At the same time, there are 60 certified green buildings in Prague with an area of 729,381.8 m<sup>2</sup>. We can see more about this trend in Table 2.

Tab. 2 - Green buildings within Prague. Source: authors's own processing data taken from GBIG, 2022

City / Metrics	Certified	BREEAM Projects/Buildings	LEED Projects/Buildings	$\sum$ LEED m <sup>2</sup>
Prague	60	34	41	729381.8

We currently register 34 BREEAM-certified projects and 41 LEED-certified projects in this area. As part of LEED certification, 12 buildings have the highest level of quality at the Platinum level. Such projects include Florentinum (2014), Main Point Karlín (2012), Element Prague (2019), and Green City Court (2012). Also, in 2013, the Green City Court project received an award for best design and performance. At the same time, in 2020, the Prague Parkview building received 97 out of 100 points and was declared the second greenest office building in the world (SKANSKA, 2021).

Architecture in the Czech Republic, specifically in Prague, developed purposefully based on conditions dictated within the Soviet Union. Therefore, in Prague, we do not experience a breakthrough in the sustainability of buildings in terms of whether a total number per capita, a specific type of building, or the economic strength of the city or region.

### Warsaw

The largest V4 country in terms of geographical and demographic parameters - Poland, used the same architectural style as the other countries in Visegrad group. Warsaw, the most significant capital of the Central European area, has more than 1,777 million population in this area. Inhabitants, thus, have an obligation to constant urban or regional development. Ensuring affordable housing through the private or public sphere must create a typical intersection with the population's demand. Based on data from 2020, there are more than 2,104,322 buildings in Warsaw, of which 32.97% are owned by natural persons (Polish Statistical Office, 2022). There were also 2,232 owned private companies in the year. On a cumulative scale, this represents 0.11% of the total housing stock of the City of Warsaw. In the sense of circular economy, we present a more sustainable architecture in Table 3.

Tab. 3 - Green buildings within Warsaw. Source: authors's own processing data taken from GBIG, 2022

City / Metrics	Certified	BREEAM Projects/Buildings	LEED Projects/Buildings	$\sum$ LEED m <sup>2</sup>
Warsaw	86	57	41	600896.86

From publicly available data, there will be up to 86 certified green buildings in Warsaw by 2022. We have the most certifications within the BREEAM projects when there are up to 57 of them. A Case Study was also created within the BREEAM certification of the Trinity Park III project (2014). Currently, 41 projects/buildings have the recognized LEED metric. In total, these projects/buildings have around 602569.14 m<sup>2</sup>. At the same time, 12 are at the highest level of Platinum. Among the specific projects, we can successfully include Business Garden Warsaw Building 3-7 (2017), Skanska Property Poland office - Atrium 1 (2015), or Eurocentrum BGD Office Complex (2017).

### Budapest

Budapest is the most dominant country in the circular economy in the V4 in terms of sustainable architecture. The capital of Hungary is inhabited by 1.756 mils. Based on data from the Statistical Office of the Republic of Hungary, there are currently 937,543 buildings. In total, 18% of the whole country's population lives in Budapest, while in the suburbanization of the given environment, it is around 25%. Within the housing stock, we record the highest rate of green buildings within the V4, while the data are shown in Table 4.

Tab. 4 - Green buildings within Budapest. Source: authors's own processing data taken from GBIG, 2022

City / Metrics	Certified	BREEAM Projects/Buildings	LEED Projects/Buildings	$\Sigma$ LEED m <sup>2</sup>
Budapest	458	396	106	1607222.7

This phenomenon also corresponds to the situation where there are 458 certified green buildings in Budapest. Three hundred ninety-six projects/buildings are BREEAM certified, and 106 projects/buildings are LEED certified. Of these, 11 have the highest Platinum level, where we can mention projects such as Green House Budapest (2013), Citibank Corner Arena (2012), Bloomberg Budapest Roosevelt 7/8 Office (2014). They also received three awards, among such known awards include, e.g. for the Corvin Promenade project (2014), when he won the ULI Global Awards for Excellence. In Budapest, there are more than ten times more green buildings than in Bratislava; compared to Prague, it is more than seven times more and compared to Warsaw, it is more than five times more. However, when calculating the total number of buildings, these numbers differ from the numerical value, but not in essence. This also indicates the situation when these green buildings have more than 1,607,222.7 m<sup>2</sup>.

In answering our research question, Budapest has the largest share of green buildings in its portfolio, which significantly exceeds other capitals within the V4 group. For better understanding of research question, we summarise the results it in Table 5.

Tab. 5 - Green buildings within the capitals of the V4 countries. Source: authors's own processing data taken from GBIG, 2022

City / Metrics	Certified	BREEAM Projects/Buildings	LEED Projects/Buildings	$\Sigma$ LEED m <sup>2</sup>	$\Sigma$ Number of buildings
Bratislava	50	33	23	209217.6	40108
Prague	60	34	41	729381.8	108146
Warsaw	86	57	41	600896.86	2104322
Budapest	458	396	106	1607222.7	937543
$\Sigma$	648	520	208	3148391	3190119

Summarizing the overall situation within the V4 capitals, we can state that the total number of green buildings is 648 in total. In contrast, up to 70.67% of green buildings are located in Budapest. Warsaw follows with 13.27%, Prague with 9.26% and Bratislava with 6.79%. Across the entire V4, countries gained the most certified buildings in the system BREEAM section when 520 projects receive this certificate. Even in this case, Budapest dominates with a 76.15% share of certifications within the examined cities. Warsaw continues with 10.96%, Prague with 6.54%, and Bratislava at 6.33%. We achieve subsequent LEED certification in Budapest with a total cumulative share of 50%. Subsequently, with the change, Prague has the 1st unit more than Warsaw. Prague, therefore, has a 19.71% share of the total number of green buildings with LEED certification. Warsaw has a 19.23% share, and Bratislava with 11% share. These buildings within the V4 have an area of 3,148,391 m<sup>2</sup>. Furthermore, in terms of number of buildings, there are currently 3,190,119 buildings in the V4 area. The highest number of buildings are located in Warsaw, 65.96% of the total.

From the point of view of another Climatescope metric from Bloomberg NEF from 2021, which focuses on three sectors of sustainability assessment like Transport, Buildings and Power. Within the evaluation, they record values, the maximum of which is a value of 5 in three categories - Experience, Fundamentals, and Opportunities, which focus on the overall view in the researched category. In the framework of the Buildings sector, we recorded the following values, which are graphically displayed in the framework of figure 1.



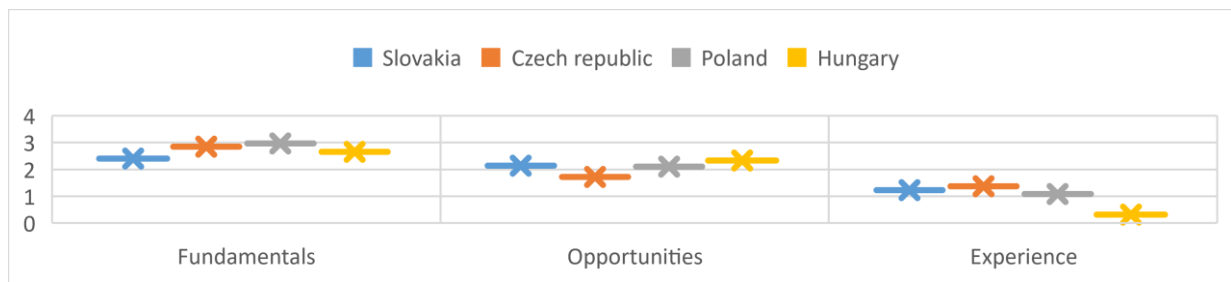


Fig. 1 - Evaluate the sustainability of buildings using the Climatscope metric. Source: actually processing the authors based on data from Climate Scope, 2022

From the point of view of the evaluation of the Buildings category within Europe, we perceive Finland as the best country with a score of 2.90/5, Denmark with a rating of 2.88/5 and the Netherlands with a rating of 2.67/5. From the view of V4, the best place was Poland, which took ninth place with a rating of 2.88/5. The Czech Republic continues in 14th position with a 2.20/5, and Slovakia with a 2.04/5. The last place in the V4 was occupied by Hungary, which achieved a rating of 1.99/5 and placed in 20th place (Bloomberg NEF, 2022).

*RQ2: What urban development within the circular economy is recorded within the capitals of the V4?*

Secondary knowledge from the IESE Cities in Motion Index has been used to answer the second research question. This global metric was created by the University of Navarre, which annually measures developments in 174 cities worldwide in 9 self-contained categories, indicating aspects of urban development in terms of Smart City - focused on sustainability or quality of life. The study synthetically uses the CIMI indicator, which is the penetration of aggregated results in the examined categories, while the highest value is at the level of 100. For individual indicators, we enter the general location within the surveyed sites. Due to epidemiological restrictions in 2021, we focus on the available data from 2020 in Table 6 and evaluate them from the point of view of circular economy.

Tab. 6 - Results of the Motion Index within the V4 capitals in 2020. Source: own processing based on the IESE Cities in Motion Index 2020 study, 2022

Category / City	Bratislava	Prague	Warsaw	Budapest
Economy	97	88	76	135
Human capital	31	37	72	34
Social cohesion	9	22	47	105
Governance	31	35	8	56
Technology	138	79	106	105
Mobility and transportation	74	44	47	31
Environment	32	30	99	49
Urban planning	45	90	14	120
International outreach	111	23	56	39
<b>CIMI Evaluation</b>	<b>60.26</b>	<b>65.36</b>	<b>62.93</b>	<b>57.87</b>
Overall ranking of countries	62	39	54	74
2019 ranking of countries	70	47	69	73
2019 CIMI rankings	59.92	64.47	60.13	59.65

From the point of view of the circular economy, from the view of the Environment category, Prague ranked best in 30th place. At the same time, Bratislava continues in 32nd place, Budapest in 49th place and Warsaw in 99th place. Reykjavík is the world's best city in this category. From the point of view of the Urban Planning category, on the other hand, Warsaw

was ranked best in 14th place, followed by Bratislava in 45th place, Prague in 90th place and Budapest in 120th place. In this category, New York ranks among the leaders. From Visegrad region, Prague was the 79th best. On the contrary, from the point of view of technology, the V4 countries belong to the worst cities in terms of their implementation into the process. Overall, the most prosperous city in this category is Hong Kong. On the contrary, the worst is Bratislava, which placed 138th out of 174th places. In mobility and transportation, on the other hand, mainly cities were placed in the top 50, except for Bratislava, which ranked 74th. We also noticed a positive trend in location, when in addition to Budapest we recorded a positive trend of improving our position in the capitals Bratislava and Prague, both in the 8th place, while Warsaw improved by up to 15th place. Budapest, however, fell by one place to 73rd place. This was also reflected in the CIMI Evaluation, when Bratislava improved by 0.34 points, Prague by 0.89 points, and Warsaw by 2.8 points. Budapest lost 1.78 points (IESE, 2020).

We can also answer the hypothesis we have chosen with the results obtained from the research questions.

*H1: Buildings in the V4 countries produce at least 50% of the total CO2 per city.*

The formulas was then entered in individual data for the respective capitals and the overall average for those cities. To answer our hypothesis, we must first define the CO2 produced per building within each city, using the following formulas.

$$\frac{\text{produced CO2 by the city in MtCO2}}{\% \text{ share of CO2 per city from buildings}} \quad (1)$$

$$\frac{\text{buildings responsible for MtCO2 in the city}}{\sum \text{ number of buildings}} \quad (2)$$

To better define the results, we have summarized this graphically in Table 7.

Tab. 7 – Produced by CO2 building within the V4 cities. Source: actually processing of the authors on the basis of data taken from statistical portals, 2022

\*average number

Indicator / City	Bratislava	Prague	Warsaw	Budapest	Σ
Σ number of buildings	40108	108146	2104322	937543	3190119
Produced by CO2 city in MtCO2 (2019)	0.59	7.01	5.64	6.38	19.55
% share of CO2 per city from buildings	39%	73%	81%	61%	63.5%*
Produced by CO2 buildings in MtCO2	0.23	5.15	4.67	3.89	1.24*
CO2 produced per building in kg	5.1771	47.6289	2.1701	4.1510	3.8915*

After calculating the CO2 produced per building in MtCO2, we can determine the average current CO2 load on a specific number of buildings. When adjusting the results for certified buildings, the total value did not change significantly due to the low number of such buildings under V4. Based on our numbers, the average CO2 load per building under V4 is 3.8915 kg. The highest load is in Prague at the level of 47.6289 kg and again the lowest in Warsaw at the level of 2.1701 kg. Studying the hypothesis, we found that, from the overall point of view, buildings make up the CO2 demand at an average level of 63.5%. The highest value is in Warsaw at 81% and the lowest in Bratislava at 39%. Overall, therefore, the hypothesis was not confirmed.

## 5 DISCUSSION

Due to the involvement of countries within the European Union in ratified programs, the capitals of these countries have committed themselves to reduce their CO<sub>2</sub> consumption by 40% by 2030, increasing renewable sources to at least 32%, or improving energy efficiency to at least 32.5% (European Commission, 2021a). By 2050, many countries have committed themselves to achieve a minimum % of CO<sub>2</sub> production.

### Bratislava

The capital city of Slovakia has an average cost in terms of energy consumption per building of € 126,075. The Ondrej Nepelu Ice Stadium accounted for the highest costs, with an annual cost of energy consumption of € 792,546.2. By 2030, Bratislava has committed itself to reduce CO<sub>2</sub> production by 55%. In total, buildings make up 39% of the CO<sub>2</sub> produced. According to statistics from the Statistical Office of the Slovak Republic, Bratislava produced 0.5874 MtCO<sub>2</sub> in 2019 (Statistical Office of the Slovak Republic, 2022). In 2020, Slovakia produced 30.73 MtCO<sub>2</sub>, which represented a decrease of 9.1%. In cumulative terms, this represents a decrease of 3.04 MtCO<sub>2</sub> per year. From the point of view of consumption and production, about 46 MtCO<sub>2</sub> was consumed in Slovakia in 2019, which, compared to production, means a deficit of 12.23 MtCO<sub>2</sub> (Our World in Data, 2022). Overall, the Slovak Republic accounts for 0.09% of CO<sub>2</sub> emissions. Slovakia plans to reduce greenhouse gas emissions by 40% in 2030 and 80-85% in 2050 compared to 1990. It is also planned to reduce CO<sub>2</sub> emissions in the EU ETS: by 43% (This represents an average annual reduction of 2.2% in 2021 - 2030) in 2030 and 90% in 2050 compared to 2005. The total share of renewable green energy should be 32% of gross final energy consumption in 2030 (MHSR, 2019). By 2030, the Slovak Republic should reach 19% of renewable sources in the heating and cooling framework. For support, the Slovak Green Home support program was created in 2014 to help households and apartment buildings with the possibility of using green equipment for heating and cooling the building. A budget of 45 mils. was set aside for 2022. €. In 2020, the share of energy from RES in gross final energy consumption increased year on year and reached 17.35% (Energoklub, 2022). From the beginning of 2021, all new buildings must be granted 'nearly zero-energy (NZEB) status, meaning buildings with very high energy performance.

### Prague

Based on specific facts, Prague plans to reduce its carbon footprint by 45% by 2030, and at the same time, it wants to produce 8% of its energy from renewable sources. That should be 2.1 GWh per year. In 2010, Prague produced 8.8 mils. tonnes of CO<sub>2</sub>, while in 2030, it should be at the level of 4.84 MtCO<sub>2</sub>, a decrease in absolute numbers by 3.16 MtCO<sub>2</sub>. Also, a reduction in total energy consumption from 24TWh in 2010 to the target value of 21.12TWh represents a cumulative decrease of 12%. From the point of view of buildings, Prague plans to reduce heat and gas consumption by 15% by this year, while increasing the number of solar panels on buildings by another 23,000 buildings; increase smart electricity meters in households and institutions by 500,000 m; as well as increase by 70,000 more sustainable heat generators (boilers). The total CO<sub>2</sub> load of buildings represents 73% of the total CO<sub>2</sub> within Prague. In 2019, Prague produced 7.056 MtCO<sub>2</sub>. The goal is to reduce CO<sub>2</sub> production in buildings by 56%. At the same time, the goal is to reduce by 0.5 MtCO<sub>2</sub> per year within the framework of Prague City Hall (Environment Protection Department, 2021). In total, the Czech Republic produced more than 108 MtCO<sub>2</sub> in 2017, which reduced its share by 35% compared to 1990. In 2019, Czech Republic produced 100.81 MtCO<sub>2</sub> and consumption was 103.51 MtCO<sub>2</sub>, representing an overconsumption of 2.7 MtCO<sub>2</sub>. The Czech Republic accounts for 0.25% of global CO<sub>2</sub> production (Our World in Data, 2022). It should be reduced by up to 40% by 2050. Also, in the Czech Republic, the New Green Savings grant program is used, which covers 50%

of the cost of new boilers, solar panels, and other sustainable opportunities to improve the condition of buildings (Bloomberg NEF, 2022).

### Warsaw

Warsaw produced 5,871,286 in 2021, with a cumulative increase of 7.76% compared to 2020 when it produced 5,415,498. In contrast, in 2019, it produced 5,637,881 MtCO<sub>2</sub> (Polish Statistical Office, 2022). In Poland, the production of CO<sub>2</sub> from the perspective of buildings accounted for 16.9%, representing 70 MtCO<sub>2</sub> in 2017. Of this value, 84% belonged to residential buildings and 16% to the commercial sector. Of this, 66.66% was energy consumed for heating water and space, representing 13 mils. households and 400 mils. m<sup>2</sup> of commercial space. Final 1/3 was generated by district heating (24 MtCO<sub>2</sub>): Poland operates one of the world's largest district-heating networks, with over 20,000 kilometres of district heating pipes (McKinsey & Company, 2022). In 2017, Poland produced 380 MtCO<sub>2</sub>. Poland's goal is to reduce by 40% with the generation of CO<sub>2</sub> to an absolute value of 271 MtCO<sub>2</sub> by 2030 and in 2050 to reach, as well as other countries, to achieve the lowest possible level of CO<sub>2</sub> production. However, it is necessary to consider Poland's cultural conditions, which are strongly tied to the coal industry. Nevertheless, McKinsey & Company expects a reduction of 46 MtCO<sub>2</sub> by 2050, with 80% of households having to significantly change their current consumer behaviour from a renewable energy perspective. Poland's 2040 energy strategy envisages a 23% reduction in the economy-wide final energy consumption from 2007 to 2040. Over 2015-2020, gas consumption increased by approximately 18%, heating a third of the space in 2020. Overall, production in Poland is higher than CO<sub>2</sub> consumption by 11.35% than in the only V4 country. From a global perspective, Poland accounts for 0.86% of global CO<sub>2</sub> production (Our World in Data, 2022). Like other V4 countries, Poland has created a "Clean Air" program to support the replacement of old heating appliances (boilers) within the household with new strict criteria.

### Budapest

The capital Hungary plans to reduce its carbon footprint by at least 40% by 2030. Budapest's overall energy consumption related to CO<sub>2</sub> emissions totalled 6,109,183 MtCO<sub>2</sub> in 2015 (MTI-Hungary Today, 2021). In 2019, this represented 6.38 MtCO<sub>2</sub>, 13% of the total. This would represent a cumulative reduction of 2,443,673.2 MtCO<sub>2</sub> in 2030. Also, this year, a 130x increase in energy generation through solar panels, a 50% increase in heat generation using renewable energy, and an increase of 350 hectares of protected areas within the surroundings of Budapest (Budapest, 2021). In 2015, Budapest consumed energy at 27,928,557 MWh, with residential buildings consuming the most (40%). Residential buildings consumed 11.2 MWh of energy. City buildings accounted for 2% (138,432 MWh) of the total consumption value and 19% for Tertiary (non-municipal) buildings, equipment/facilities (1,164,735 MWh) (Budapest Főváros Városépítési Tervező Kft., 2021). In total, buildings in Hungary generate 15% of the total CO<sub>2</sub>. By 2030, CO<sub>2</sub> production is expected to be reduced in buildings by 34% and by 2050 by as much as 99% (McKinsey & Company, 2022). From the point of view of CO<sub>2</sub> production and consumption, in 2019, CO<sub>2</sub> consumption at the level of 49.08 MtCO<sub>2</sub> and production in the amount of 67.08 MtCO<sub>2</sub> were recorded in Hungary. This, therefore, represents a difference of 18 MtCO<sub>2</sub>. From a global perspective, Hungary accounts for 0.14% of global CO<sub>2</sub> production (Our World in Data, 2022). At the same time, they are trying to achieve heating and cooling with renewable sources by at least 29% by 2030, but also to reduce heating with natural gas to 50% by this year as natural gas dominated in 2019 with the share of 55% of the total heating and biomass in this year in the share of 27%. Since 2021, Hungary has directly and indirectly supported sustainable heating options with solar panels, ecological boilers and others through the "Warmth of Homes Program" (Bloomberg NEF, 2022).

## 6 CONCLUSION

In this paper, we focused on applying the perception of the circular economy in architecture and urbanism concerning its environmental, ecological, social or technological impact within the capitals of the V4 countries. We used two research questions and a hypothesis to fulfill the goal. Through research questions, we pointed out the current state of green architecture and the overall perception of urbanism in V4 conditions. Using the hypothesis, we calculated how much CO<sub>2</sub> per building within V4 and determined the average CO<sub>2</sub> load of buildings within cities. These helped us achieve the primary goal, which defined the areas just examined in terms of observed phenomena in the circular economy.

### Economic impacts

When defining economic impacts, it is necessary to consider their long-term impact, both in macroeconomic and microeconomic factors. From the macroeconomic point of view of Poland itself, decarbonisation savings of up to 75 bn. € are expected in 2050 per year on operating costs. We can also expect an increase in job opportunities by 250-300 thousand and also, an increase in GDP of 1-2%. Nevertheless, the investment cost in this area is expected to amount to 380 bn. € by 2050. Hungary, Czech Republic and Slovakia are expected to invest in this area in 150-200 bn. € by 2050. From the point of view of the economic spectrum, it is estimated in the European area within new green buildings, the decrease in average operating costs over the next 12 months by 8.6%, while in the 5-year cycle, the savings increase to 13.2%. We see more savings in renovated or reprofiled green buildings, where the savings increase by 12.3% over the next 12 months. However, the savings will increase to 17% over the next five years.

### Environmental impacts

EU countries have committed themselves to reduce their CO<sub>2</sub> consumption by 40% by 2030, increasing renewable sources to at least 32%, and improving energy efficiency to at least 32.5%. Many V4 countries are trying to reduce their electricity load on coal or biomass. The current war in Ukraine has caused many obstacles and opportunities to reduce the Russian Federation's dependence on natural gas. Thanks to this, new measures are being taken with the aim of a more sustainable and economic intention. Hungary plans to reduce its dependence on natural gas to 50% by 2030. Other V4 countries follow this trend.

### Social impacts

It is the involvement of countries in national support programs to support the replacement of older heating and cooling appliances to streamline the entire sustainability process within buildings that directly impact reducing CO<sub>2</sub> emissions as buildings within the V4 produce up to 63.5% of CO<sub>2</sub> within cities. This support has long been used by these countries' people and is increasing every year. In Slovak conditions, due to the interest of Slovak households, the support increased from the original 15 mils. € to 45 mils. € for 2022.

### Technological impacts

Technological impacts are closely related to new innovative (smart) sustainable materials, processes or products. Rising standards in architecture, prestige from internationally recognised awards, or adaptation to current trends and challenges are strictly regulated by current projects. The LEED, BREEAM or DGNB standards specify how current projects must meet the established conditions. At the beginning of 2021, all new buildings in Slovakia must acquire the status of "nearly zero-energy" (NZEB), meaning buildings with very high energy performance. Furthermore, this trend is one of the objectives of the European Union.

The results just found encourage the authors to further investigate this issue from a theoretical and a practical direction. As the issue of sustainability in the field of urbanism, architecture has

a direct impact on the quality of life within cities, which must be regularly developed to meet the challenges and trends.

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# KEY FACTORS OF DIGITAL ECONOMICS WITHIN INDUSTRY 4.0 AND SMART TECHNOLOGIES

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## **Abstract**

The aim of the contribution is to approach and analyse the use of Industry 4.0 technologies as a collective designation of technologies and concepts of value chain organizations. Explain their positive impact on the environment and business activity through the use of innovative technologies. The first part of the contribution is focused on the Industry 4.0 approach itself, describes the development of the industry, its principles. Subsequently, the key factors of Industry 4.0 are discussed. The paper describes the trend of technologies for ubiquitous production. The first part of the paper describes the trends in technology, and the second part of the paper is devoted to the Digital Economy and Society Index (DESI) for 2021. Concepts for the implementation of the elements of Industry 4.0. in each country are explored in the next parts. These modern technologies that are gradually being introduced into common practice by more and more countries. Thanks to European countries such as Germany, Switzerland or Scandinavian countries, which are characterized by a high share of industry in GDP, we can see how Industry 4.0 manifests itself and advances at a considerably fast pace. The conclusion of the contribution is devoted to the analysis of knowledge from the given issue.

*Keywords: smart technologies, Industry 4.0, environment, digitalization*

## **1 INTRODUCTION**

If we accept the hypothesis that industry in all its branches is the main element of economic development, then we accept that industrial revolutions in the past had an impact on the overall development of the world. The technologies of the Industry 4.0 concept brought an innovative revolution not only in the field of industry as such, but also entered the life of every person, where they make the world around us intelligent. The term Industry 4.0 represents a network of intelligent technologies that use connectivity, intelligence and work in real time, can communicate with each other and influence and control each other. The Digital Platform Revolution is an inspirational guide for leaders in transforming existing businesses (Parker et al., 2017).

For the previously mentioned reasons, in the contribution we face with the characteristics of the Industry 4.0 concept and its principles of operation, applied technologies in the company and their subsequent impact on ecology with regard to sustainability and competitiveness.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

Industry 4.0 is a collective label for technologies and concepts of value chain organizations. Within modular structured smart factories, CPS monitors physical processes, creates a virtual copy of the physical world and makes decentralized decisions. Through the Internet connecting objects, CPS communicates and cooperates with itself and people in real time. (Weyer et al., 2015, pp. 579-584)

Among the key factors of Industry 4.0, we will focus on the following:

- Radio Frequency Identification (RFID) is a sensor technology that is widely used to identify and locate objects in industry. This technology makes it possible to enter small data such as

wire production in the form of labels. The tags are sensitive to electromagnetic radio waves and allow identification according to the data stored in them. The advantages of RFID tags are flexibility of use, very small size, they can be reused, they can be read by an RFID reader when they get close without physical contact or visualization (AB&R, 2019).

- Internet of Things: Internet of Things helps connect various mechanical devices to create a vast network that communicates data between devices and intelligent services for fast, on-demand business decisions.

- Cloud computing: Cloud computing is the provision of on-demand computing services over the Internet. Services such as servers, storage, databases, networks, software, analytics, intelligence and others can be used on demand. This is infrastructural support for services via the Internet (Kaur et al., 2019, pp. 377-398).

- High-speed wireless networks: A wireless network allows two or more devices to connect to each other to exchange data wirelessly. Wireless networks are quite obvious in connecting various Internet devices connecting objects to make network connectivity simple, cost-effective and maintenance-free. Manufacturing plants are densely packed with machines where connecting every device via a wired network is not a common task.

- Big Data Analytics: Big data analytics is a complex process of processing and analyzing data to provide meaningful insight or information hidden in a large data set. Big data analysis is very useful in obtaining business and informational insights (Rouse, 2018).

- AI and ML not only collect data but also analyze it, transforming it into information and insights that help create accurate business or operational strategies. ML is an application of artificial intelligence that focuses machines on artificial learning and thus on intelligent decisions. ML algorithms allow a machine to learn and uncover deep information or insights embedded in datasets (Marr, 2016).

- Cognitive computing is a technology platform that uses AI in computing, making it smarter. Cognitive computing simulates human cognition to solve complex problems, especially problems that are ambiguous and uncertain. The computational model learns from experience and develops its decision-making capabilities (Rouse, 2018).

- Additive manufacturing is often called 3D printing. It applies to building components by depositing material layer by layer. This transformative industrial approach makes it possible to build objects that are much stronger and lighter. This technology helps to create a large number of shapes, complex shapes without the need for welding or assembly of individual parts (GE, 2019).

#### Trend technologies for ubiquitous production

- Internet of Things connects a number of cyber-physical objects or things, such as devices, services, cars, farms, factories, even animals, to the Internet to improve manufacturing capability. These networked devices can communicate through standard protocols and share data in different environments through modems, routers, switches, and mobile stations. The integration of smart objects makes the system agile, intelligent, and networked, making the Internet of Things (IoE) the Internet of Everything (IoE), which consists of the Internet of Services (IoS), the Internet of Manufacturing Services (IoM), and the Internet of People (IoP) (Solanki & Nayyar, 2019, pp.379-405).

- Cyber physical systems (CPS) is a technique for connecting, managing, and interacting between physical devices and computing applications that are tightly integrated with the Internet and its users. In a CPS, physical and software components operate at different spatial, behavioral, and temporal scales and are interconnected in many, ever-changing ways. The

concept of CPS is a network of cooperating computing and physical devices. The data and information processing capability of mechatronics is gradually transforming the obsolete production level into an environment to realize elastic, reconfigurable, scalable and network-supported collaboration between embedded devices and business process arrangements. Since CPS is a human-centric technology, communication with humans can be achieved through mobile devices such as smartphones, tablets or wearable devices. Augmented reality technology can be unified with things at the time of installation, operation and maintenance of automation systems, increasing the productivity and competence of operators by providing various relevant information.

- Cloud Computing

The Internet connecting objects, Big Data and cloud computing together with AI are the empowering factors of Industry 4.0, which basically focuses on industrial automation. In recent years, information technology has greatly advanced due to cloud computing with on-demand self-service, ubiquitous network access, rapid elasticity, pay-as-you-go and location-independent resource pooling. Clouds with the ability to manage infrastructure represent a vast space of easy-to-use and accessible virtualized resources such as various development platforms, applications, services, hardware that can be dynamically reconfigured to enable self-service, economies of scale and optimal resource utilization (Wu et al., 2013, pp. 121-146).

Cloud manufacturing enables ubiquitous and convenient on-demand network access to a shared space of configurable manufacturing resources. Extended resources are captured in cloud services and managed in a centralized way in cloud manufacturing. Clients can use cloud services according to their needs. Cloud users can request services at all stages of the product life cycle, such as product design, manufacturing, testing, and management. A number of information systems are deployed in the cloud, and smart things are connected to the same cloud. The cloud helps with superior access to design and engineering resources anywhere, anytime with minimal management effort or service provider interaction. Ubiquitous access to resources increases scalability, flexibility and virtualization. Various virtualized services provided by cloud service providers that effectively enable distributed collaboration and computing. Some of the most popular cloud services are:

- Software-as-a-Service (SaaS): With this service, a single user can get any software on his computer by paying a fixed subscription for a specific period of time over the Internet from the cloud. the service provider that is the owner of the license of a particular software application.
- Platform-as-a-Service (PaaS): As with a single software application, it can provide a single entire platform for the customer to use.
- Infrastructure-as-a-Service (IaaS): Infrastructure such as a server, machine, robot or data center can be acquired as a service without building or hardware/software investment and maintenance costs, but only with a specific service fee.
- Desktop-as-a-Service (DaaS): A customer can host their entire desktop computing environment with data storage and network communication equipment (Wang et al., 206, pp. 97-112).

- Web services

A web service is a self-contained, virtually unified logical system that consists of software modules accessible over the Internet that perform duties, solve problems, or perform transactions for a user or application. The Internet of Services is an important support for Industry 4.0 and CPS (Reis & Franco, 2018).

Smart Factory Web Architecture: Smart Factory Web Architecture (SFW) supports connectivity and work capabilities for physical resources to protect data and service integration in cross-site application situations. SFW includes factory equipment management, factory equipment data management and analysis, and a service interface. It provides an open API for the SFW portal, as well as for Enterprise Information System (EIS) applications, such as the Manufacturing Execution System (MES) or ERP system, can be involved in the SFW involving various devices, sensors or control systems (Jung et al., 2017).

- Virtualization and virtuality

In computing, virtualization is the process of generating a virtual or logical form of a device or resource, such as a server, operating system, network, storage, or a single application program. For the development of self-optimization, self-configuration and self-diagnosis capabilities in a dynamic manner in a smart factory environment, resource virtualization or the creation of digital twins is very important. Digital twins are virtual replicas of physical devices that can be used to run simulations before the actual devices are built and installed. A real-time simulation of a physical object by a digital twin offers insights into the performance and potential problems of a factory, shop or warehouse. Virtualization helps create a logical copy by merging sensor data obtained from monitoring physical processes and devices. A virtualized view of operations through a 3D interface helps monitor physical processes and manage complexity, optimize processes and reduce equipment downtime. A digital twin could even help as a prototype itself before any physical version is created. As the Internet of Things connects more complex things with the ability to produce data, and thanks to the benefits of virtualization and digital twin technologies, ubiquitous manufacturing in Industry 4.0 has moved to a higher level. The digital twin helps identify deviations from ideal settings for business optimization, thereby improving quality and achieving greater efficiency in the physical world (DELOITTE, 2017).

- Virtual reality

Augmented reality and virtual reality are two pillars of the implementation of virtualization in Industry 4.0. Augmented reality is about connecting digital elements with real-world activities. Virtual reality offers a computer-aided simulation tool to create a real environment. The rapid development of new technologies such as RFID sensors or smartphones, etc., which have enabled real-time data flow and the integration of CPS with augmented and virtual reality techniques, greatly help in creating a simulation to achieve the intelligent design paradigm.

- Epistemology and ontology

The adoption of new industrial practices enabled by Internet of Things technologies, AI and ML in the design, planning, optimization of decision support systems throughout the manufacturing life cycle leads to the need for an intelligent knowledge management system to acquire, represent and extract manufacturing knowledge used for factory automation by machine interpretable way. Epistemology is a philosophy that decides what knowledge should be acquired, the process of acquisition, and how that knowledge can be delivered dynamically with omnipresence, context awareness, and omnipresence. An ontology is a method for representing manufacturing knowledge that can be used to configure, coordinate, and supervise a manufacturing system in a machine-interpretable way. The production ontology can be specified for the entire production life cycle (Leitao et al., 2005, pp. 58-66).

- Ubiquitous user-centric environment

The Internet of Things has the ability to learn itself by responding in an intelligent way to realize user requests through context awareness to solve open-ended scenarios driven by a complex and wide range of different human behaviors. Virtual/Augmented Reality-based systems depend on HMI and collaboration, resulting in the unification of human sense, sentiment and

emotion to create an advanced virtual collaboration environment where users can feel the omnipresence of man and machine while working in the same environment.

The coming industrial era is about greater collaboration and interaction between humans and machines, robots that make human work better and faster. In Industry 5.0, robots will collaborate more. These next-generation robots are cheaper, more mobile and more flexible than their previous versions. They will be able to work safely alongside human workers without the need for any safety cage. The introduction of cloud robotics will allow workers to control robots remotely, eliminating the need for an operator to be physically present. The flexibility and efficiency offered will make production truly global. The Robotics-as-a-Service (RaaS) concept will allow small companies to pay for usage without upfront investment in robotics (Hobbs, 2018). All this will be well supported by the launch of high-speed 5G networks, which, together with the widespread use of wearable devices at the factory level, will take augmented reality in manufacturing to a new level. In addition, Industry 5.0 will mean that workers will be more creative and products will be more customer-focused and customized. Despite these developments, it is worth noting that Industry 5.0 will be an innovation of Industry 4.0 and not a completely new paradigm (Waterfield, 2018).

### **3 METHODOLOGY**

The following work procedure was used in writing this paper, which is intended to help clarify the current situation of the implementation of the fourth industrial revolution in selected countries of the European Union. The contribution is divided into the following scientific activities: analysis of theoretical starting points in the field of Industry 4.0; analysis of the impact of Industry 4.0 in selected countries of the European Union and comparison of the results between selected countries with the average of the European Union; analysis of the approaches of selected countries of the European Union towards the full implementation of the elements of Industry 4.0, which lead to the achievement of this goal by 2030. As part of the evaluation and comparison of the results between the selected countries and the average of the European Union, the methods listed in the available literary sources were used. The following methods were used in the work: The method of analysis in determining the current situation in selected countries associated with the implementation of the elements of Industry 4.0. The synthesis method, which was used when formulating the conclusions and goals of individual initiatives of selected countries until 2030. The comparison method was used when comparing the levels of implementation of Industry 4.0 elements in selected countries of the European Union with the average of the European Union in the given area of Industry 4.0. Methods of induction and deduction, which were used in the formulation of general and partial conclusions to the established facts.

### **4 RESULTS**

According to the results of the Digital Economy and Society Index (DESI) for 2021, Slovakia ranks 22nd among the 27 EU member states. Compared to 2020, it remains in the same place. Slovakia is just below the EU average. 54% of Slovaks have at least basic digital skills and 27% have above-average digital skills, compared to the EU average of 56% and 31%, respectively. The number of companies providing ICT training in 2020 was 16%, the EU average is 20%. The share of ICT specialists in total employment also increased and reached the EU average. The overall use of fixed broadband in Slovakia steadily increased from 72% in 2019 to 78% in 2020. Slovakia has significantly improved the roll-out of superfast internet and progressed with very high capacity 5G network coverage, improving its 5G readiness score. 52% of SMEs have at least a basic level of digital intensity, which is below the EU average of 60%. 15% of

businesses used at least two artificial intelligence (AI) technologies in 2020, compared to 25% in the EU. The number of companies using electronic invoices is 16%, which is significantly below the EU average of 32%. Most indicators for the area of digital public services are lower than the EU average, with the exception of 68% of e-government users in 2020, compared to 64% in the EU. (European Commission, 2021)

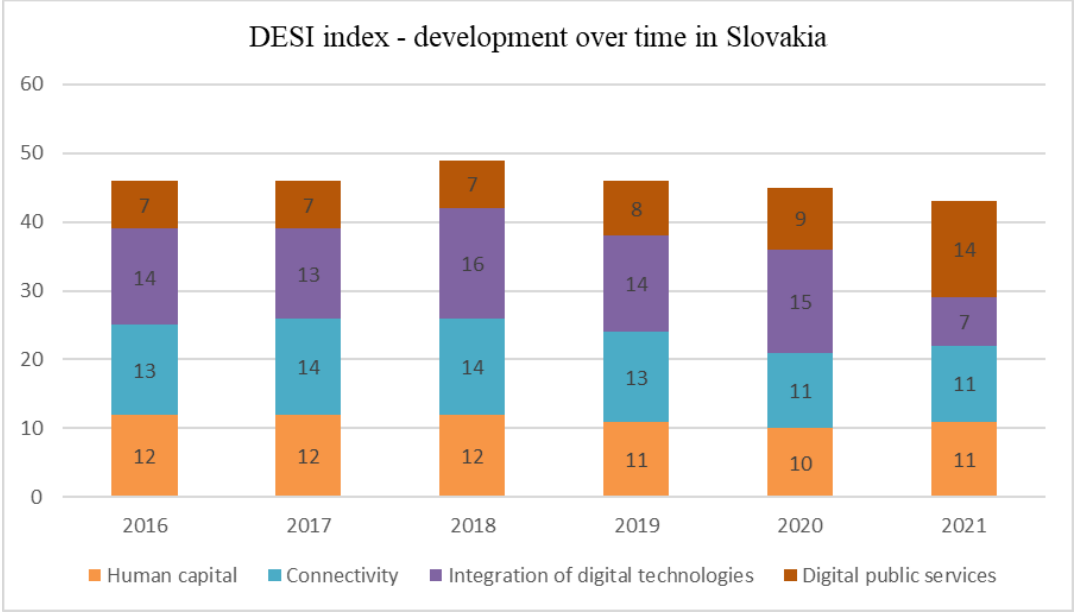


Fig. 1 – DESI index - development over time, Slovakia, years 2016 - 2021. Source: own processing according to <https://ec.europa.eu/newsroom/dae/redirection/document/80599>

To compare the development of the implementation of Industry 4.0, we used the indicator of the density of the use of robotics and automation in industrial enterprises. This indicator is growing globally and accelerating all over the world. 126 robots per 10,000 employees is the new global average for the density of robots in manufacturing industries. By region, the average robot density is 134 units in Asia/Australia, 123 units in Europe, and 111 units in the Americas.

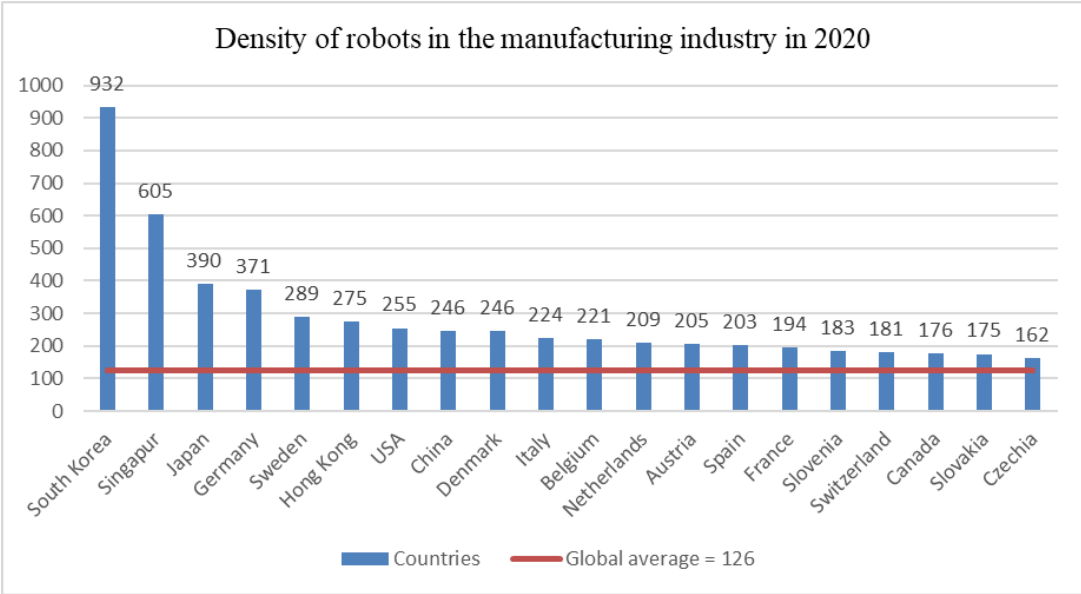


Fig. 2 – The density of robots in the manufacturing industry in the world in 2020. Source: own processing according to IFR reports: <https://ifr.org/ifr-press-releases/news/robot-density-nearly-doubled-globally>

The top 5 most automated countries in the world are: South Korea, Singapore, Japan, Germany and Sweden.

Germany, the most automated country in Europe, is in 4th place worldwide with 371 units. Annual delivery in 2020 accounted for 33% of total robot sales in Europe.

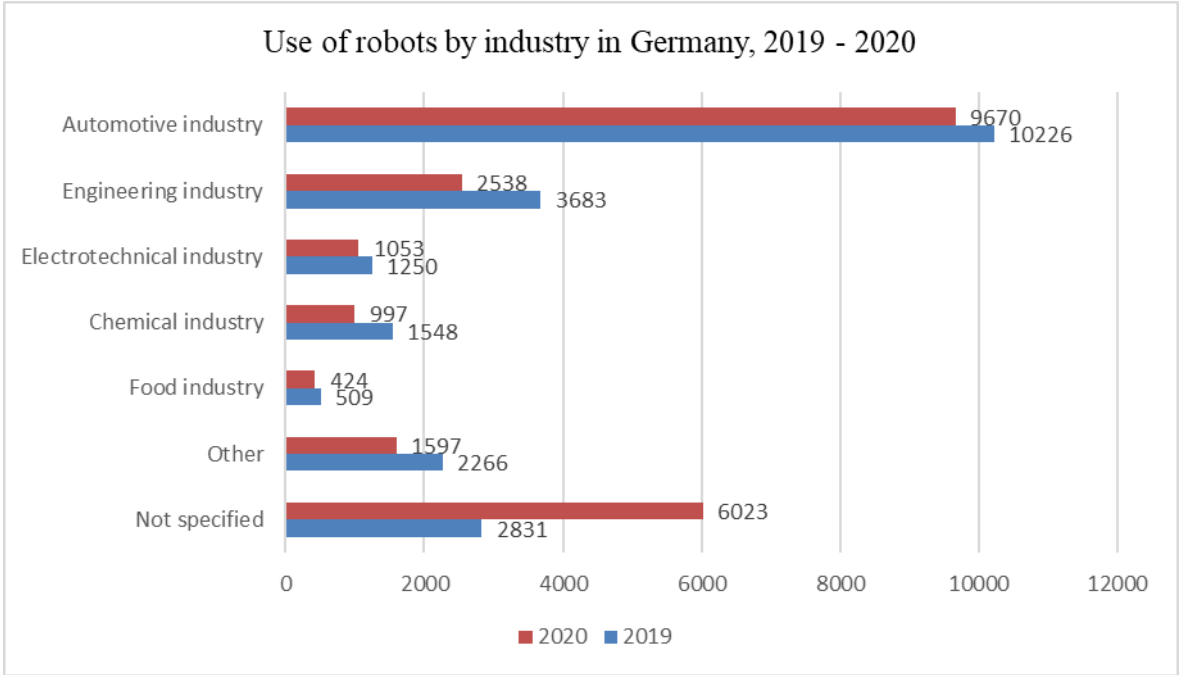


Fig. 3 – Use of robots by industry in Germany between years 2019 and 2020. Source: own processing according to IFR reports: [https://ifr.org/downloads/press2018/2021\\_10\\_28\\_WR\\_PK\\_Presentation\\_long\\_version.pdf](https://ifr.org/downloads/press2018/2021_10_28_WR_PK_Presentation_long_version.pdf)

Germany's robotics industry is recovering, driven mainly by strong overseas trade rather than the domestic or European market. Demand for robots in Germany is expected to grow slowly, driven mainly by demand for low-cost robots in general industry and non-traditional manufacturing.

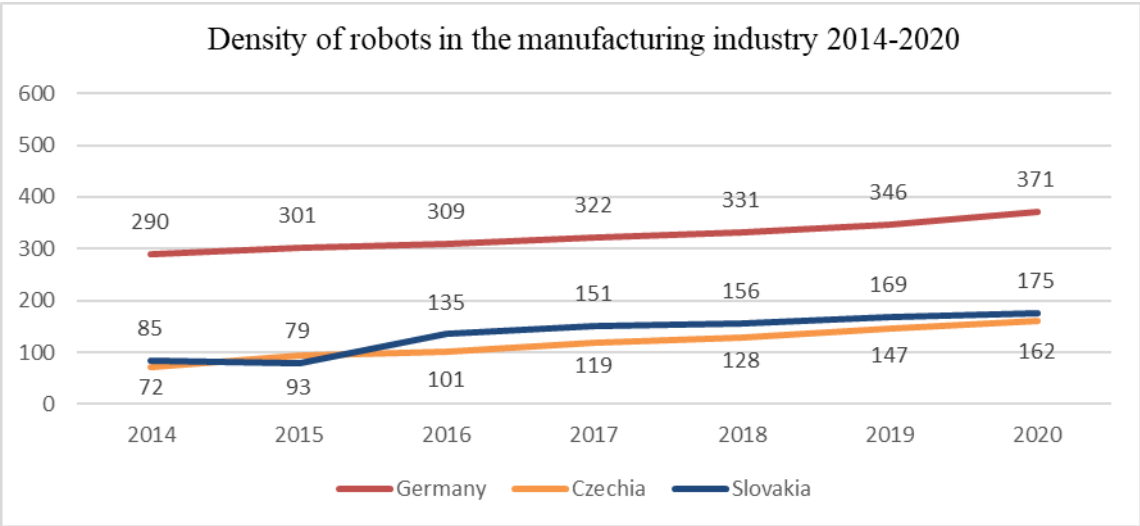


Fig. 4 – Robot density in the manufacturing industry in in selected countries between years 2014-2020. Source: own processing according to IFR reports: <https://ifr.org/news/robot-density-rises-globally>

In the graph of the density of robots in the manufacturing industry in selected countries of the European Union between 2014-2020, the best place was Germany, which is the European leader

in the 4th position worldwide. Furthermore, we note that the Czech and Slovak Republics are in a similar place, because they achieve similar values in the implementation of industrial robots in companies. However, the current trend in the mentioned countries indicates constant progress and an increase in the ratio of the use of robots in companies. It is estimated that in the next 5 years Slovakia and the Czech Republic will reach a value of over 200 industrial robots per 10,000 employees, and in Germany we estimate a value higher than 400 industrial robots for the same the same number of employees. Concepts for the implementation of Industry 4.0 elements in each country are also set to these predictions.

## **5 DISCUSSION**

We can observe the development of Industry 4.0 mainly by looking at industrial enterprises. Many of these industrial enterprises are located in Europe. Thanks to European countries such as Germany, Switzerland or Scandinavian countries, which are characterized by a high share of industry in GDP, we can see how Industry 4.0 manifests itself and advances at a considerably fast pace. An important part of this is the developed industry in these countries, but we assume that the governments of these countries also play a significant role in the advancement of Industry 4.0. Governments that have for many years focused on and considered it important to emphasize the development of engineering skills, lifelong learning and training, research and development, and investment in infrastructure. All measures taken and expenditures directed to these areas support the country's industry and help the economy better adapt to the conditions of the fourth industrial revolution. Many industrial companies are definitely investing in the use of digital technologies and are dealing with digitization. Efforts are being made in many areas of economic and financial policy to enable Europe to take advantage of the opportunities offered by digitalization.

Since 2014, the European Commission has been monitoring the progress of member states in the digital field and publishes annual reports on the Digital Economy and Society Index (DESI). Each year, the reports include country profiles, which help Member States to identify where they need to prioritize action, and thematic chapters containing an analysis of key areas of digital policy at EU level. The DESI index improves the methodology and considers the latest technological and policy developments. DESI indicators are now structured around the four main areas of the digital compass: Human Capital, Connectivity, Integration of Digital Technologies, and Digital Public Services. (European Commission, 2021)

## **6 CONCLUSION**

We are currently in the era of Industry 4.0, hailed as the age of cyber-physical systems that have taken manufacturing and related industrial processes to an unprecedented level with flexible manufacturing including manufacturing, supply chain, delivery and maintenance. A key enabler of this is ubiquitous technology, which has led to the new term ubiquitous manufacturing, meaning that the manufacturing process can be handled from anywhere at any time. Ubiquitous manufacturing has changed traditional production planning and assisted in automated material handling and dynamic reconfiguration. Ubiquitous manufacturing has been well supported by technologies such as AI, machine learning, intelligent robotics, big data analytics, etc. All of these have moved to intelligent automation together. Advances in ubiquitous technologies such as Internet of Things, Cloud and Edge computing, real-time communication, and many others have enabled industries to take full advantage of ubiquitous manufacturing, such as cloud manufacturing, cloud robotics, internet manufacturing, lean manufacturing, additive manufacturing. Although Industry 4.0 has not yet developed into its absolute form and



industries are still in transition to adopt it, due to rapid technological progress we are on the verge of entering the Industry 5.0 era.

Industry 4.0 represents both a threat and an opportunity for countries - it depends on individual countries how they approach this challenge. The development of new technologies is currently taking place at a pace unprecedented in history. Therefore, the speed of the countries' response to these changes is particularly important, or a proactive approach and an effort to determine trends. Slovakia, as a country extremely dependent on development in other countries and on a global scale, has no other option than to participate in the implementation of Industry 4.0. The concept of intelligent industry for Slovakia is a suitable first step to start a society-wide discussion on this topic and at the same time to start the implementation of concrete measures. In general, it is necessary to take any steps in connection with Industry 4.0 with regard not only to the internal conditions in the country, but also to the activities of other states. Germany, as a pioneer of the idea of Industry 4.0 and an important partner of Slovakia, has a privileged position in this regard (Ministry of Economy, 2016). Since the next step in development is the shift and use of Industry 4.0 ideas on a societal level in the form of the Internet connecting objects, data and services, the manifestation of which will be the Smart City/Smart Region concept, with the current interconnectedness of all systems, no other option than international cooperation will be possible.

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# SYSTEMATIC LITERATURE REVIEW: PREDICTIVE SAFETY MANAGEMENT IN THE AUTOMOTIVE INDUSTRY

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## Abstract

There are various approaches in preventive occupational safety and health management (OSHM) to protect employees in the long run and reduce accidents. Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method, 39 articles dealing with the current state of OSHM and preventive models of OSHM were identified through the Scopus, Web of Science, and Google Scholar databases. Furthermore, the emphasis is on how approaches from other industries can be transferred to the automotive industry to reduce accidents over time. Construction, chemical, agricultural, weather forecasting, the stock market, road traffic, and general approaches are among the industries discovered. Long-term successful OSHM was discovered to be a multivariable problem, with no single solution always working. The combination of different approaches appears to be the most promising among the 39 studies. Machine learning methods are best suited to model such a problem due to the complex structures and many influencing factors. Some approaches based on resilience engineering and neural networks can be transferred to the automotive industry based on the data used or taking key figures into account.

**Keywords:** *Safety management, occupational safety and health management, predictive safety, PRISMA, automotive industry, preventive methods*

## 1 INTRODUCTION

Approximately 977.070 accidents, including 737 fatal, happen in Germany's wood and metal processing business yearly (DGUV 2020). Heinreich (1931) established the accident pyramid, which allows accidents to be classified because not all accidents have the exact cause (from fatal to near-miss accidents). Bird et al. (1996) showed a correlation between fatal and near-miss accidents (1 to 50.000). They established through their investigation that a series of near-miss accidents lead to moderate to severe accidents.

Risks in some industries can be forecasted using technological advancements and the development of more advanced models. Resilience engineering (RE) is currently used to model these system failures (Brian Thoroman & Salmon, 2020). A system with RE can change to the new circumstances that arise from a problem or failure. Through this adaptability, harmful situations can be anticipated in occupational safety and health management (OSHM), considering the subsequent application of preventive measures. Ranasinghe et al. (2020) investigated the RE method of construction remodelling. The effectiveness of this model was found to be significantly influenced by several RE-indicators from the literature. In addition to the models proposed, Li et al. (2020) present a method for educating construction industry workers that is currently in use. Construction remodelling carries a higher risk of accidents, which is why training methods and their efficacy are discussed. One-time training or teaching had a substantially lower success rate than training that builds on previous training or is repeated frequently.

A literature review on preventive OSHM and the modelling of multivariable problems in the field of OSHM are done using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach. The approaches discovered through literature research will then

be applied to the automotive industry to the extent possible, given the available information and framework conditions. More specifically, the paper is structured by the subsequent sections, including (1) introduction, (2) theoretical background, (3) research methodology, (4) results, (5) discussion, and (6) conclusions.

## 2 THEORETICAL BACKGROUND

The various fields in which the methods used in this study have a place in the literature can be divided. For example, the articles on cross-sectoral work, agriculture, social economics, the stock market, and the chemical and construction industries can be split. The main concern is the long-term protection of personnel, which can be influenced by training (Li et al., 2020) or using a model to identify weaknesses (Zeng et al., 2020). However, some techniques use digital planning to prevent the emergence of a possible problem (Farghaly et al., 2021). Essentially, two methods can be distinguished.

On the one hand, it is necessary to concentrate on the personnel to make them more aware of potentially dangerous situations; on the other hand, computer-based systems can foresee potential threats or shut down the system in an emergency. After then, the computer-based systems can be further split into simple linear models (Yoshitake & Shino, 2018), deep neural networks (Paltrinieri et al., 2019), or a combination of different models (Baker et al., 2020).

According to the current state of the literature, as determined by this PRISMA-compliant literature search, there are only articles in the automotive sector relating to autonomous driving and vehicle safety systems, but not their production. This article included a total of 12 articles on the topics of autonomous driving and vehicle safety systems. In addition to the construction industry, which has nine included articles, the transportation industry accounts for nearly one-third of the total literature.

## 3 METHODOLOGY

Literature research was carried out using the PRISMA approach described in the first chapter. The objective is to demonstrate the current status of OSHM in significant industries before examining how the different strategies might be applied to the automotive sector. The initial step was to find literature regarding safety management, workplace hazards, accidents, risks, and preventive OSHM. This article was written using systematic literature searches. This benefit is that they summarise the literature, try to be objective in their assessment of the articles used, and have a high standing in the scientific community. This search was then broadened in a subsequent stage to incorporate preventive models and methods in OSHM.

The research in this work only covered papers and articles that had already been successfully published. Therefore, grey literature or expert interviews have been excluded. Additionally, free access was a requirement for the articles. Finally, only German and English articles were considered, another restriction. The following flow chart displays the complete literature search results (Fig. 1).

Scopus and Web of Science databases were used primarily for the literature search. Google Scholar was also employed. The keyword for the search criteria includes Systematic literature review (SLR) combining with “safe\* management”, “OSHM”, “risk management” “predict\* safe\*”, “risk assessment”, “predict\* health\* safe\*”, “predict+ hazard assessment”, “predict\* risk assessment”, and “hazard assessment”. In June 2022, the last keyword search for the given phrase was performed. The following key terms were used to narrow the search for predictive OSHM models: "predict\* models", "predict\* OSHM models," and "OSHM models". The search string that was employed is given below.

TITLE-ABS-KEY ( systematic AND literature AND review AND safety AND management ) AND ( LIMIT-TO ( OA , "all" ) ) AND ( LIMIT-TO ( DOCTYPE , "re" ) OR LIMIT-TO ( DOCTYPE , "ar" ) ) AND ( LIMIT-TO ( SUBJAREA , "ENGI" ) OR LIMIT-TO ( SUBJAREA , "SOCI" ) OR LIMIT-TO ( SUBJAREA , "HEAL" ) OR LIMIT-TO ( SUBJAREA , "ENVI" ) ) AND ( LIMIT-TO ( EXACTKEYWORD , "Systematic Review" ) OR LIMIT-TO ( EXACTKEYWORD , "Review" ) OR LIMIT-TO ( EXACTKEYWORD , "Meta Analysis" ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) OR LIMIT-TO ( LANGUAGE , "German" ) )

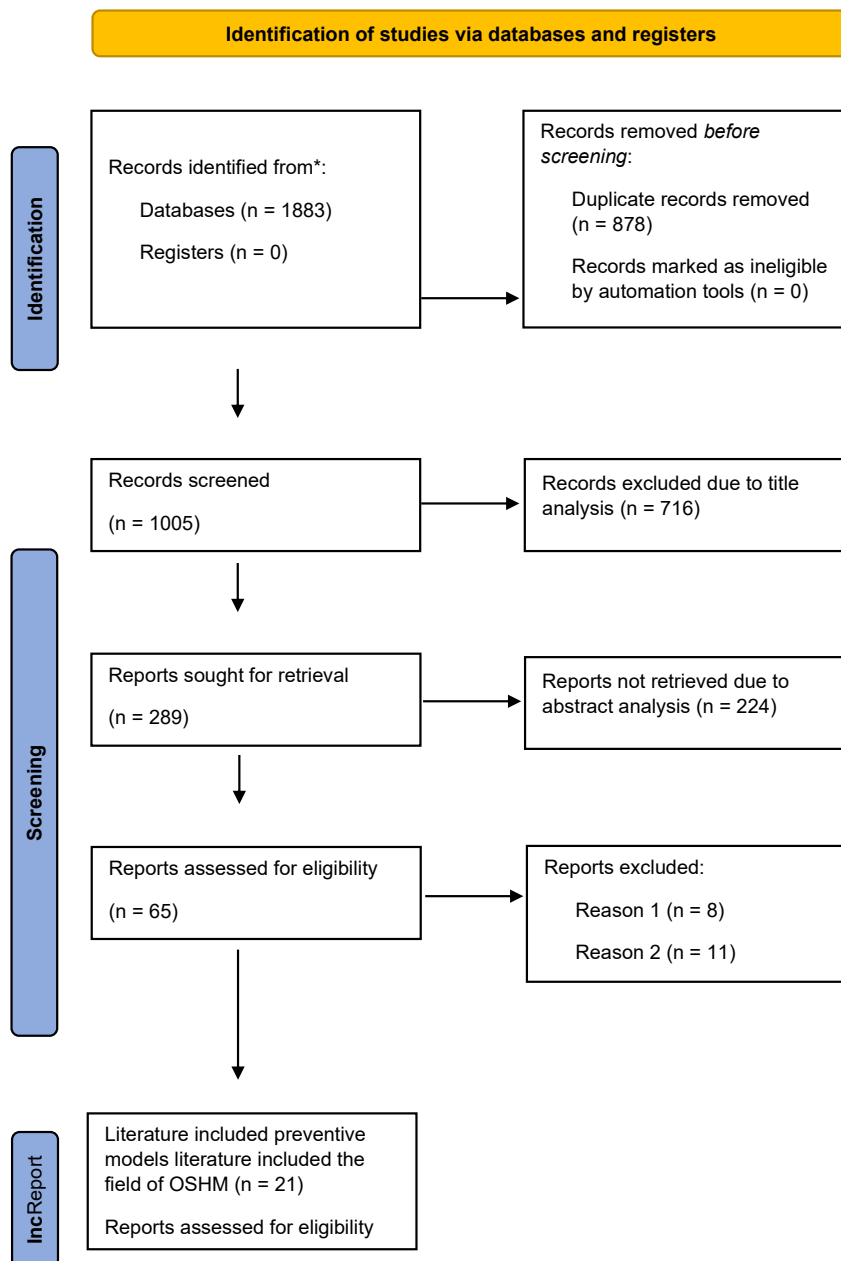


Fig. 1 - PRISMA flow chart for the literature review and the selection of the included paper, own Illustration based on (Pahlevan-Sharif et al., 2019). Reason 1: The source's methodology was inconsistent. Reason 2: The source does not offer a definitive conclusion pertinent to this investigation. Reason 3: Inappropriate topic (medicine).

The studies were evaluated using the PRISMA approach's various analysis steps, with articles excluded at each stage. Before doing a deeper analysis, all duplicates were eliminated after the literature review. All paper titles were then evaluated. The abstracts were examined after that. The final number of included articles was determined by completing a full-text analysis and excluding additional articles (Fig. 1). Predictive methods used in medicine (illness treatment) and sports medicine (disease prevention) were not included. Only studies that directly addressed OSHM in the industry and preventive models in the OSHM were comprised; the sector was not, however, given additional consideration at this time.

It can be concluded that scientific databases (Scopus and Web of Science) and the strict inclusion criteria in these databases are suitable for sound research. Furthermore, considering comprehensive literature searches were actively done, it may be expected that at least one of the included reviews contains information on all notable articles from recent years.

The articles were split into the categories (Road traffic, Chemistry, General, Agriculture, Socioeconomics, Weather and Stock Exchange) indicated at the beginning and given to a sector for the final evaluation (field of OSHM and preventive models of OSHM). The findings are discussed in the next chapter, along with potential changes to individual methods of preventive OSHM in the automobile sector.

#### 4 RESULTS

The outcomes of a comprehensive review of the literature and a meta-analysis of the literature are reported in the ensuing chapters. In addition, a review of the literature on OSHM was conducted. Furthermore, preventive models in OSHM were investigated. In the following chapter, the two approaches will be examined separately. Since the search was restricted to publications published between 2000 and June 2022, it became evident from the literature that most publications were published in the recent few years.

The year 2021 represents 41% of the 39 sources used in this review. 2020 has a 20% increase, with 2019 coming in second with a 15% increase. In 2022, 10% are already present, with 7.5% of these attributed to preventive OSHM models. The annual publication count for both search strings is shown in Figure 2.

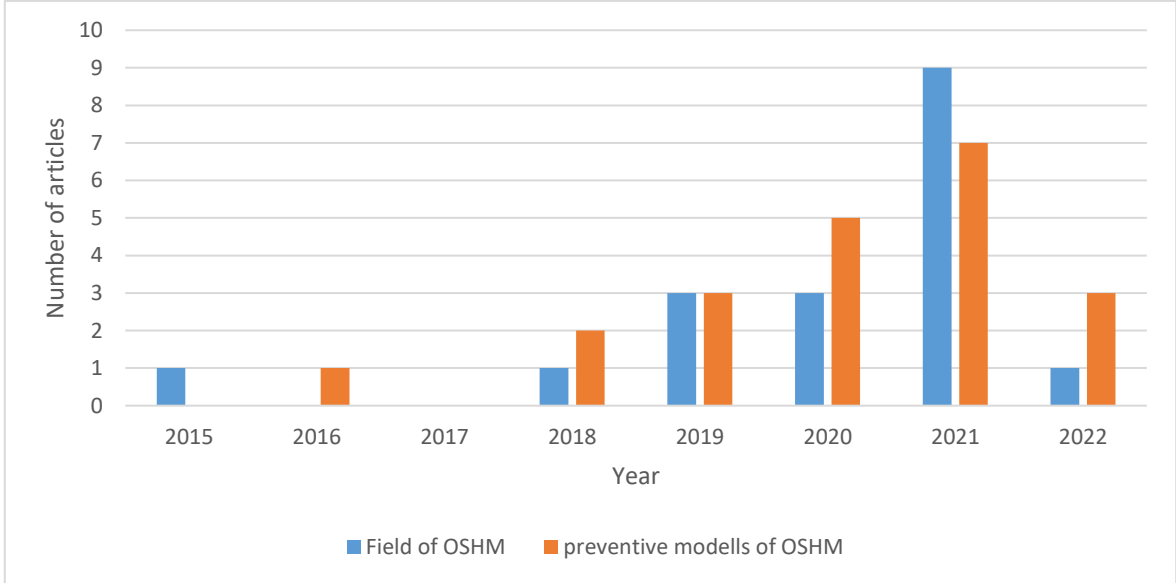


Fig. 2 - Display the publication through the years for each search direction.

The sources used can also be broken down into sectors that are specific to each subject. For example, table 1 shows that 44% of construction companies are related to the field of OSHM. On the other hand, the road transportation sector takes the top spot in the preventive OSHM models with 47%. The oldest article included in this research was written in 2015. This demonstrates that OSHM has significantly grown in relevance over the past few years and that specific hot spots can be found depending on how the search is interpreted.

Both searches returned the same number of articles in the category of general articles. Chemistry comes second in preventive models, with 19%, after traffic. Models may be made more quickly in this field than in others due to the descriptions of particular processes and defined goals (Schmitz et al., 2020).

18 of the 39 articles in this article are systematic review searches. The remaining 21 sources are topic-specific and address a particular issue (Tab. 1). The fact that 11 of the 18 evaluations followed the PRISMA methodology suggests that the paper seems to be of higher quality. In addition, 6 followed the guidelines set forth by Kitchenham et al. (2007). In essence, this entails the creation of specific research questions, the acquisition of data, the extraction of data, and subsequent analysis. The method described by Kitchham et al. (2007) can be derived from the structure of a paper, although no detailed information on the methodological approach was provided.

For the topic-specific publications, the research was always dependent on already-existing data, which was frequently unavailable to a sufficient level. Two methods of the procedure can be identified. On the one hand, the method addresses a current or ongoing issue before attempting to discover a solution considering the information at hand. The strategy of creating something preventively to avert issues in the future is a second option. The second strategy excels in the road transportation industry, where proactive action is done to reduce collisions or enhance intersection safety. About 80% of solutions to a given problem depend on artificial intelligence (AI) or machine learning techniques due to industrialisation and technological advancement. The growth of training opportunities and employee communication accounts for about 15% of all methods, whereas general approaches - which are techniques that are not categorised in either category - account for about 5%.

Tab.1 - Sector-specific division of the included literature for each of the two search directions.

Category	Field of OSHM	Preventive models of OSHM
Road traffic	2	10
Chemistry	2	4
Construction	8	1
General	3	3
Agriculture	1	0
Socioeconomics	2	0
Weather	0	2
Stock Exchange	0	1
<b>Sum</b>	<b>18</b>	<b>21</b>

The methods used to create the model are shown in Table 2. There are no combinations, and only the original model is listed. Table 2 lists six distinct modelling approaches and their associated functionality. The uses in the literature column show that linear regression and neural networks are the most used. The ARIMA model and the hierarchical model demonstrate that models are combined, implying that both model approaches are derived from the same source.



Tab. 2 - An overview of the models used in the included literature

<b>Model</b>	<b>How the model works</b>	<b>Literature</b>
<b>First-Principle-model.</b>	The process of reducing a significant unity to its smallest possible unit	Ahooyi et al., 2016
<b>Linear Regression</b>	A dependent variable is attempted to be explained by independent variables	Yoshitake & Shino, 2018; Paltrinieri et al., 2019; Baker et al., 2020
<b>ARIMA model</b>	Time series description and analysis	Xiong et al., 2021
<b>Neuronal networks</b>	A model with multiple variables that can represent dependencies and complex issues	Liu et al., 2022; Wang et al., 2021; Farid, 2021; Kim et al., 2021; Skuratov et al., 2020
<b>Markov model</b>	is a stochastic method for changing systems at random	Ma et al., 2020
<b>Hierarchical model</b>	A model with branches but a distinct origin	Xiong et al., 2021

## 5 DISCUSSION

The SLR in OSHM will be discussed first. The different models and methods of preventive OSHM were then considered, and the extent to which they can be adapted to the problems in the automotive industry was determined.

### 5.1 The SLR of OSHM analysis

Vigoroso et al. (2021) approach to introducing digital games in various work areas is a very complex task. The article focuses on agriculture and the potential for computer games to positively influence safety awareness, behaviour and machinery handling and aid in the long run. The findings of this study demonstrated that game-based safety training was efficient. On the other hand, there are detractors because, in the case of implementation, high costs result from the necessary technical equipment and ongoing maintenance and servicing costs (Craig, 2013). There are also expenses for necessary new developments and expansions. Aside from cost considerations, there are also motivational concerns. The structure of such a safety game must be such that it can be repeated as often as desired in the event of failure. However, the player's motivation should always be maintained so that the association with security management remains positive (Kwegyir-Afful & Kantola, 2020; Kamkuimo et al., 2020). The issue with video game-based safety training is that the number of participants for effectiveness testing is rarely greater than ten (Kuindersma et al., 2017; Golovina et al., 2019). Gender research would be interesting to pursue further. Women account for approximately 42% of all video game users. Based on this, it would be necessary to investigate the efficacy and increase of women in male-dominated jobs to bring everyone up to the same level, if possible (Din & Gibson, 2019; Gallagher, 2016). Video games' approach could be transferred to the automotive industry as digitalisation and virtual reality advance.

Craig et al. (2019) systematically identified security vulnerabilities and key features within socioeconomic systems. Based on these key features, an adaptation model was created and built. The problem with this identification is that it was done by expert teams and thus cannot be entirely subjective. Furthermore, identifying weak points is difficult because they are optimally determined by the system rather than before.

Li et al. (2020) presented a review of educational measure effectiveness. The first issue was that education effectiveness was measured using surrogate measures rather than actual injury outcomes. The literature review supported this conclusion. The results of the 35 included studies revealed significant heterogeneity. However, the bias in the individual articles under consideration was moderate. As a result of the research, it was determined that while educational measures are beneficial, they do not prevent accidents sufficiently in the long run. To improve the validity of these measures, it was proposed that they be tested with placebo measures to ensure the long-term effectiveness of the defined measures. The automotive industry employs a wide range of educational measures, the efficacy of which has been demonstrated. The placebo method could be used to put existing measures to the test to obtain more sustainable key figures and advance safety management.

Risk acceptance criteria (RAC) could be used to assess the risk of a process, extending the training metrics developed by Li et al. (2020). Panagiotis and Koulouriotis (2021) conducted an SLR on this topic and discovered a wealth of literature on Poisson distribution RAC. As a result, it was discovered that RACs are extremely important, particularly in the field of industry. Furthermore, it was recognised that the scientific community's acceptance and motivation to develop new RACS has significantly increased. There are numerous key figures and RAC in the automotive industry. However, new RAC development is complex because they should ideally be identical across manufacturers for better comparability.

Through this literature review, three approaches in the construction sector were identified. First, the modern design approach, for example, aims to prevent accidents during construction and subsequent remediation work (Farghaly et al., 2021; Costella et al., 2020). Second, there are approaches to behavioural safety measures to reduce injury rates and promote employee health (Mullan et al., 2015; Muñoz-La Rivera et al., 2021), and finally, the RE approach mentioned earlier (Ranasinghe et al., 2020). All the approaches identified aim to keep employees safe in the long run.

Farghaly et al. (2021) initiated a program to motivate architects to pay attention to safety gaps that arise during construction or maintenance work during the planning phase and to eliminate them as best as possible. The behaviour change approach was not identified as a viable option in the construction industry. Based on the literature review, it was discovered that the approaches used were inadequate. Possible explanations included changing working conditions and a language barrier. This example demonstrates the importance of having a safety management system in all languages. This language barrier exists in the automotive industry, among different nationalities and international operations, but it has already been overcome. A new method for high-risk workplaces was developed as part of the RE approach presented by Ranasinghe et al. (2020). First, building rehabilitation indicators were identified and then evaluated. Top management commitment, awareness, learning, and flexibility were identified as the top four indicators. Because research in this area is still in its early stages, there is still much potential in this field. This method could be used in the automotive industry as well. A large amount of data allows for identifying key indicators and subsequent evaluation.

To make autonomous driving even safer, it is necessary to make an accurate behavioural prediction based on other road users. Kolekar et al. (2021) conducted an SLR on this topic and discovered that artificial intelligence-based solutions are up-and-coming for making road traffic safer. Figure 3 depicts the various models used to predict behaviour. The problem with this prediction is that it does not account for weather conditions, reflections, poor network quality, and other factors. Furthermore, there is still a lack of data, which is critical for modelling and the quality of the final model. This method demonstrates that large amounts of data must be available to develop a reliable model for complex problems. However, this model's approach can only be applied to the automotive industry to a limited extent because handling personal

data is a significant challenge and, thus, too complex at the moment. Furthermore, cameras are also not an option because the data would have to be stored, reintroducing the data protection issue and violating the employees' privacy.

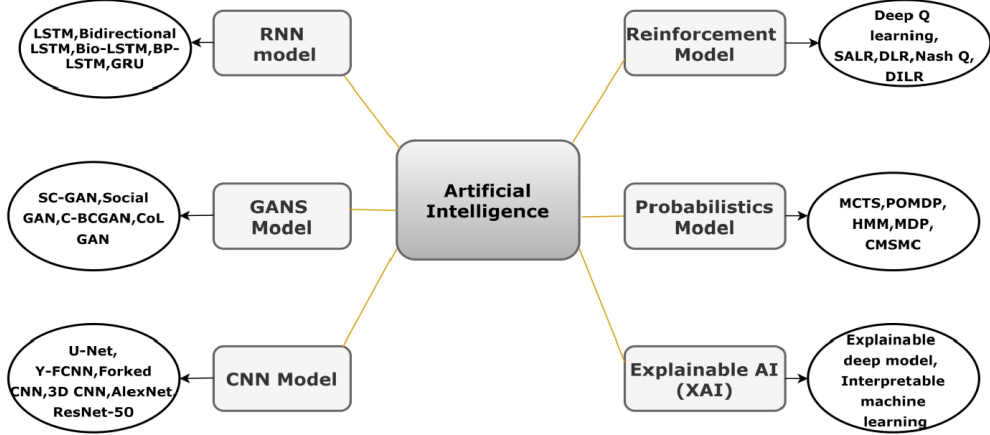


Fig. 2 - "Behavior prediction using different artificial intelligence-based models" (Kolekar et al., 2021; P.: 10).

**5.2 The preventive models of OSHM analysis**

In the field of weather forecasting, two approaches are being pursued. The first is an event prediction approach (Wang et al., 2021), while the second is a Kuban-region-specific approach that deals with damage (Plyuschikov et al., 2019). Both studies demonstrate that deep learning methods can simulate complex problems. However, because both works are particular and tailored to a specific problem, they cannot be applied to the automotive industry. Furthermore, specialised databases, such as GIS, would complicate transfer. Nevertheless, this work has demonstrated that deep learning methods are appropriate for the automotive industry's complex OSHM problems.

There are accident prevention models of OSHM. These are related to the prediction of road traffic accidents (Ma et al., 2020), the design of intersections and roundabouts (Gallelli et al., 2021), and the analysis of driving behaviour (Nouh et al., 2021; Yoshitake & Shino, 2018), and accident prevention or, at the very least, injury reduction (Leledakis et al., 2021). A deep-learning method for analysing driving behaviour is developed by Nouh et al. (2021). Using this model based on historical data sets obtained from the driver, the system can perform a risk classification divided into high, medium, and low. If the system detects a medium or high level of danger, it should intervene and take control of the vehicle. A total of 15% was kept verifying the training data on which the final model was tested. However, the presented model has a flaw in that not enough practical experiments were conducted to improve recommendation accuracy.

Further experiments could reduce the error rate, making the model more scalable. Also, because only five drivers were chosen, the amount of data was minimal. In theory, the possibility of behavioural analysis in the workplace is a good idea. However, being an employee is not enough to implement long-term safety management. The nature of the job and other environmental factors would have to be considered in the evaluation. However, on the plus side, these methods can create a predictive model that makes accurate predictions and thus currently protects road users. Oh et al. (2018) developed a method for reducing the risk of excavator accidents on construction sites in the construction industry. The excavator driver had several blind spots on the construction site, so these areas were covered by using two laser scanners. Two safety indices were developed, which determine the time until the calculated collision, and a perception index, which intervenes in the system to varying degrees depending on the safety

level. This approach has already been tested and implemented in the field. This approach would only apply in the automotive industry to the safety of fully automated robots. As a result, this application would be particular.

There are many different approaches to preventing accidents in the chemical industry. Some approaches deal with process safety (Schmitz et al., 2020) and alarm systems that predict material failure (Ahooyi et al., 2016; Liu et al., 2022). Schmitz et al. (2020) use a retrospective data example to show how information from organisational factors could have prevented the near miss from developing prematurely. Organisational factors influence the quality or trustworthiness of barrier systems, which indirectly affects the occurrence of accidents. Management systems, such as management, communication, and coordination, may also be regarded as "performance-influencing factors" or "error-causing conditions". The issue is that there are too many communication adjustments, especially in larger companies with multiple management levels. The problem is that each manager comes from a different background, meaning certain things are valued, making it easier for a problem to be perceived differently. In the automotive industry, the possibility of identifying factors influencing process safety is provided, and the review of individual departments and processes is controlled, including through external audits. Furthermore, whether this approach is truly a long-term way to prevent accidents or merely one component of a more extensive safety management system.

Skuratov et al. (2020) developed a method for stock market analysis based on data analysis and anomaly detection. A neural pattern detector searches for the exact boundaries of technical analysis figures to detect patterns. Trading decisions in any market can thus be significantly improved. Pattern evolution can be automated by estimating their duration in time and amplitude values. The parameters used to determine the trend and create patterns are customisable and can be changed to meet the analyst's or trader's needs. This neural network could be adapted for data analysis in the automotive industry. New starting points for preventive OSHM could be discovered by analysing the data and detecting anomalies.

Finally, non-industry-specific approaches should be regarded. Baker et al. (2020) developed a model that indicates the severity of the injury, the type of injury, the part of the body affected, and the type of incident by combining various models. This model is based on over 1000 accident reports that eight independent experts reviewed. A total of 80 attributes were evaluated based on the results of this evaluation. Because this evaluation was demanding and time-consuming, Tixier et al. (2016) refined and modified their approach (model with a 95% success rate) to make extraction faster and easier for future industries. Baker et al. (2020) presented approaches for the construction industry, testing the following model approaches, XGBoost and linear Support Vector Machines (SVM) and Natural Language Processing (NLP). The SVM model had a marginal advantage over the XGBoost model. This SVM model is currently used in work scheduling to predict safety. Because the model's results are based on accurate data, the detected vulnerabilities can be considered. The problem with this model is that it can only predict about half of the accidents in the construction industry because of the inhomogeneous nature of the working conditions. Working conditions in the automotive industry are more uniform, which improves the identification of relevant attributes and the model's reliability.

Based on this research, the number of different articles clearly shows that neural networks are used much more frequently than other methods and are thus more suitable for the complex problems of OSHM. Furthermore, the articles are up to date and have a wide range of applications. Neural networks are used in everything from material failure to stock market prices to meteorological forecasting and autonomous driving. The increase of publications on preventive models demonstrates the advancement of technology and the continued development of models, approaches, and opportunities.

## 6 CONCLUSION

The purpose of this article was to present the current state of OSHM and the preventive models in OSHM, with a focus on the automotive industry or the possibility of transferring the approaches used to it using the PRISMA method. Different approaches could be identified based on the literature review. It was discovered that OSHM is always a combination of different systems rather than a single method, approach, or model. The current machine learning methods best represent the complexity of existing problems. Baker et al. (2020) have the most promising approach, which is most applicable to the automotive industry based on the method used and the underlying data.

The main limitations of this work stem from a lack of specific literature in the field of automobile manufacturing. Literature is scarce in both German and English on this subject. Because this topic is generating increasing interest, as evidenced by the results, this knowledge gap should be filled in the future through additional research. The purpose of this paper was not to include factors other than those mentioned in the study. Other factors may become relevant in the future. Further research can determine how various factors gain or lose relevance over time. Furthermore, the available data could be expanded, and a uniform system implemented, resulting in higher quality and reliability data.

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# THE VALUE OF DIGITISATION IN THE PROCESS OF OBTAINING A BUILDING PERMIT

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## **Abstract**

The digitalisation of public administration affects many aspects of life. One of them is the building procedure, which is not only important for citizens to secure their housing needs, but is also important for entrepreneurs, who, thanks to the completion of the process of obtaining a building permit, can start a full-fledged business. The aim of the paper is thus to map the economic, social, and societal impacts that the process of obtaining a building permit and especially its digitalisation has. Based on unique data on the digitisation of the process of obtaining a building permit, we confirmed the hypothesis of the relationship of digitisation on reducing the difficulty of obtaining a building permit. Our research uses data from the World Bank, which has collected data on the digitisation of the construction process for all countries in the world. At the same time, the World Bank produces data on the difficulty of obtaining a building permit and the level of corruption in the construction procedure. The article is intended for public policy makers who can be convinced of the importance of digitizing the process of obtaining a building permit in relation to more efficient processes.

*Keywords: Dealing with Construction Permits, digitalisation, corruption*

## **1 INTRODUCTION**

The building permit is referred to as the final permit, which is granted by the public authorities and authorises the start of the construction phase of the project. The permit is part of the planning process that aims to ensure sustainable and controlled development for the benefit of communities, the environment or the economy (Siew, et al., 2013). The process of issuing a development permit is composed of several steps in which the opinions of a large number of stakeholders need to be secured using a wealth of information (Eastman, et al., 2009) (Lee, et al., 2016).

The decline in construction investment during the COVID-19 pandemic is partly related to the likely decline in the number of building permits, which was also due to the administrative hurdles involved in processing such permits (European Commission, 2020c). However, limited construction activity has acted as a drag on housing supply for several years. Member States of European Union now have stricter planning and building regulations than in previous decades, which also has an impact on the number of building permits (European Commission, 2021b) (Eurostat, 2022). Although there has been a recovery in the number of building permits issued in recent months, investments will take time to materialise (European Commission, 2021b). COVID-19 has shown that digital technologies will play an increasing role and will also be the new default for the sector. Thanks to the COVID-19 pandemic, one of the information technologies in the construction industry, BIM, has expanded significantly. It allowed projects to proceed in digital and virtual environments even when participants could not meet in person (McKinsey&Company, 2020) (World Economic Forum, 2020). In addition to the digitisation of processes, simplifying construction procedures is also a challenge for governments. However, building permits still need to be underpinned by environmental and social policy objectives and the minimisation of illegal behaviour (World Economic Forum, 2015).

Reasonable regulation of construction helps to protect society from defective building practices. In addition to enhancing safety, well-functioning building permit and inspection systems can strengthen property rights and contribute to the capital formation process (World Bank Group, 2013). If regulations restrict land use, they lead to higher housing costs (Glaeser, et al., 2005), or overly complicated building regulations can also increase opportunities for corruption (Moullier, 2009) or raise land prices (Kok, et al., 2014). Legislation should leave room for technological advances in addition to the public interest and anticipate the emerging needs of users, e. g. architects. Therefore, well-designed building codes and standards are needed, as well as transparent and streamlined permitting processes (World Economic Forum, 2016). Regulation should also include appropriate enforcement mechanisms and penalties to help enforce legal provisions to ensure public health, improve safety and enhance environmental protection (World Economic Forum, 2016).

This article fills a gap in research on digitising the process of obtaining a building permit in several aspects. Drawing on the literature, the article comprehensively summarizes the importance of an efficient building permit process to the economy and the importance of digitisation within this process. It also fills a gap in the quantitative area, as the paper analyses international data on the digitisation of the building permit process, collected for the first time by the World Bank.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

### **2.1 The economic importance of the efficiency of the building permit process**

The process of obtaining a building permit is one indicator of the regulation of doing business in a given country (World Bank Group, 2019). Good regulation of the construction industry is important for public safety, but also for the health of the construction sector and the national economy as a whole. The construction sector accounts for 9% of the GDP in European Union countries and employs around 18 million people (EUBIM Task group, 2017). The International Labour Organisation calculates that the construction sector in the European Union accounts for 6.8% of total employment (International Labour Organisation, 2018). It is estimated that for every ten jobs directly related to a construction project, an additional eight jobs can be created in the local economy (PricewaterhouseCoopers, 2005). The construction sector is also significant in terms of the number of businesses, with 3 million businesses operating in the sector in the European Union, the majority of which are SMEs (EUBIM Task group, 2017). In OECD countries, construction contributes on average 6.06% to total value added (OECD, 2019) (indicator). However, the productivity of the construction sector has grown at about one-quarter of the rate of manufacturing over the last two decades (1.0% versus 3.6%). Even so, construction output is predicted to grow by 85% globally to US\$8 trillion by 2030. Construction will thus account for 14.7% of world GDP in 2030 (Global Construction Perspectives and Oxford Economics, 2015). The importance of the construction sector is deepened by the fact that in developing economies, the urban population is expected to double by 2030, while the size of cities may even triple (UN-Habitat, 2016). Thus, the construction industry is expected to experience growth of more than 57% and reach US\$17.5 trillion by 2030 (Global Construction Perspectives and Oxford Economics, 2015). Also based on the above, it is evident that construction activities affect almost all aspects of the economy and at the same time, the construction industry is essential for economic growth (Oladinrin, et al., 2012). However, in terms of macroeconomic trends, the construction sector is most influenced by building regulations and public investments (Jovanović, et al., 2016).

At the same time, the construction sector is also of importance in terms of achieving climate goals, where European Union countries have a target to reduce greenhouse gas emissions in

buildings by 60 %, their final energy consumption by 14 % and energy consumption for heating and cooling by 18 % by 2030 compared to 2015 (European Commission, 2020b). Achieving these targets will require a significant renovation of buildings in the EU, as 85 – 95 % of the buildings standing today will still be standing in 2050 (European Commission, 2020a). One of the sources for building renewal is to be the Renewal and Resilience Plans in EU Member States, which had to allocate at least 40 % of the resources from this financial mechanism to climate targets. Given the time frames of the Recovery and Resilience Plan, flexibility in the process of obtaining building permits at national level is essential. Also, the United Nations Sustainable Development Goals have a particular focus on infrastructure development when they support the building of resilient infrastructure (United Nations, 2015).

Valid building permits are essential to meet projected employment, GDP share or environmental targets. However, according to Asia-Pacific entrepreneurs, the time and procedures involved in dealing with building permits are the biggest regulatory barrier to doing business (Singapore Business Federation, 2009). At the same time, the top twelve factors that determine the location of a start-up business in the U.S. include construction costs and regulation of the permitting process (KPMG, 2016). Similarly, nearly half of investors have experienced adverse regulatory changes and delays in obtaining the necessary government permits and approvals to start or operate a business, i. e. including building permits, according to the survey. This can have an impact on the retention or closure of a business in a given country (Kusek, et al., 2018). In the long term, more than 40% of EU entrepreneurs think that inadequate infrastructure is a problem for their business. At the same time, up to 60% of entrepreneurs in the EU think that the complexity of administrative processes is a problem for their business. This view of entrepreneurs may also stem from the complexity of the procedures for obtaining a building permit and the subsequent construction of infrastructure. It is therefore essential that the possibility of obtaining a building permit is available to entrepreneurs.

The manual process of issuing a building permit is a subjective, error-prone and time-consuming activity that can lead to ambiguity, inconsistent assessments and delays throughout the construction process (Matthews, et al., 2015). An online consent system should create a tool to expedite the processes of obtaining planning permission. At the same time, computerisation increases transparency throughout the process, ensuring consistency without compromising quality (Samasoni, et al., 2014). At the same time, this contributes to a more conducive business environment (Veiga, et al., 2018).

**Major developments in electronic building permit systems have occurred since the early 1980s in several pioneering jurisdictions in the U.S. and Europe (U. S. Department of Housing and Urban Development, 2002). In Italy, France, or the Netherlands, electronic building permit systems were introduced in the early 1970s (Bellos, et al., 2015). However, the construction sector is still one of the least digitised sectors of the economy (European Commission, 2019a) (McKinsey&Company, 2016). With the exception of Building Information Modelling (BIM), few digital technologies have taken hold. Yet, as recently highlighted by the European Commission, the digitisation of the construction sector is not only BIM, but also includes data mining, process automatisisation and other technologies related to digital information and analytics (European Commission, 2019b).**

Based on the previous results of the electronic building permit process, the European Commission created the e-Europe initiative, which made it mandatory for European Union member states to introduce electronic building permit applications by 2005 (e-Europe 2003). Later, this obligation was extended first to 2010 (i2010 strategy) and finally to 2020 (Horizon 2020 strategy) (Olsson, et al., 2018) (Bellos, et al., 2015). According to the European Commission, e-application for building permits is one of the 20 most important e-government services (European Commission, 2016).

Also, e-services in the issuance of building permits have evolved over the years, transforming from basic submission via email to sophisticated solutions that include customized software for online submission and automatic verification of construction-technical documentation. It has moved from a system that focused on specific tasks to an integrated solution that connects users with all stakeholders, thus enabling a seamless flow of information with the ability to monitor each step in the process (World Bank Group, 2020). The digitisation of the process of obtaining a building permit also affects related public services, such as the maintenance of an archive of construction data or geospatial information (cadastre) (European Commission, 2021a).

The use of ICT tools in the building permit process is widespread throughout the world. Between 2018 and 2020, the electronic building permit acquisition service saw the largest expansion among online transactional services, up to 147.3% in 136 countries (United Nations, 2020). Almost 50% of municipalities provided the service of obtaining a building permit (ranked 5th out of 13 e-services evaluated among 40 selected cities) (United Nations, 2018). More than 80% of the systems surveyed allow applicants to track the status of their applications (the percentage is higher in developing countries – 89%) (World Bank Group, 2018) 89% of the 190 economies surveyed have building codes available online, and at the same time 51% of the economies have information on required documents, pre-approvals, and fees in electronic form. Nearly 50% of the economies allow online payments for obtaining a building permit. In this case, it is possible to analyse significant regional differences, on the one hand with a share of 77% in Europe and Central Asia, on the other hand, Sub-Saharan Africa has only 25%. Only 27% of economies have a system of issuing building permits that uses electronic submissions or cloud service. It is also possible to analyse significant regional differences. 47% of OECD countries offer such a solution and in Sub-Saharan Africa only 15% of economies have the option of e-filing or cloud platform (World Bank Group, 2020).

The introduction of ICT systems in the process of obtaining a building permit achieves significant effects. Transparency both before and after the application for a building permit is improved, as information on zoning and building regulations is available and easily accessible (World Bank Group, 2018). There are cost savings, which are at 9.6% for architects, 6.4% for engineers and 5.5% for contractors and owners for BIM users. In New Zealand in 2011, the value of permits issued annually for the construction of non-residential buildings was US\$3.64 billion. Thus, the 5.5% saving represents a potential saving of US\$182 million if BIM was used as a tool in the design and construction process (Samasoni, et al., 2014). Wider adoption of BIM is expected to deliver savings of 15-25% globally by 2025 (Boston Consulting Group, 2016) (World Economic Forum, 2016). The computerisation of processes not only speeds up the permit approval process, which also impacts higher construction spending and higher property tax revenues. According to a US study, speeding up permit approvals by three months in a 22-month project cycle could increase construction spending by 5.7% and property tax revenues by 16% (PricewaterhouseCoopers, 2005). Long delays in obtaining building permits can lead to higher transaction costs and fewer transactions (Hammam, 2014). According to a study from Germany, reducing permitting times could yield an increase of more than 40% in onshore wind power (IEA, 2019). Good legislation combined with robust enforcement mechanisms and an efficient, transparent, and affordable permitting process can ensure community safety standards, facilitate investment in new buildings and contribute to capital formation (World Bank Group, 2018). Public authorities have also reported that online submission and electronic information sharing for building approvals has saved them time and resources (World Bank Group, 2013).

### 3 METHODOLOGY

There are two sources of data on the digitisation of building permit processes. In 2021, the European Commission produced an analytical report on digitisation in the construction sector, which aimed to get a general picture of the current state of building permit systems in the different Member States of the European Union. Due to the data methodology in the analytical report itself, it is noted that the results are not statistically representative. In 2020, the World Bank conducted an international survey on 190 countries that focused on the digitisation of the building permit process in terms of the format of building permit application, digital features available during the building permit process, the use of BIM, the format of inspection, and the future implementation of BIM. By 2020, the World Bank was developing an international Doing Business ranking, which measures the time, effort, and costs of the process of obtaining a building permit. In addition to the Doing Business rankings, an international survey of entrepreneurs is also being conducted, which focuses on the time and costs of obtaining a building permit and the level of corruption associated with the process of obtaining a building permit. At the same time, the Eurobarometer measures corruption in the building permit process among EU countries. This shows that there is:

- one measure of the digitisation process of obtaining a building permit (only in 2020),
- two measures of the time it takes to obtain a building permit:
  - Doing Business (every year by 2020),
  - International survey of entrepreneurs (surveys in individual countries, not annually), and
- two measures of corruption in the process of obtaining a building permit:
  - International survey of entrepreneurs (surveys in individual countries, not annually),
  - Eurobarometer (in 2013, 2015, 2017, 2019).

We will use this data to evaluate the impact of digitalisation on corrupt behaviour in the process of obtaining a building permit and the efficiency of the processes associated with obtaining a building permit.

Hypothesis 1: We assume that there the dependence between the difficulty of obtaining a building permit and the level of corruption in the process of obtaining a building permit.

Hypothesis 2: We assume that there the dependence between the level of digitisation of the process of obtaining a building permit and the level of corruption in the process of obtaining a building permit.

Hypothesis 3: We assume that there the dependence between the level of digitalisation of the process of obtaining a building permit and the difficulty of obtaining a building permit.

Hypothesis 4: We assume that there the dependence between the level of digitalisation of the process of obtaining a building permit and the other factors (for example the GNI per capita, the better developed index of e-government, the index of higher regulatory quality or the index of government efficiency).

We expect that all observations to be significant at the 5% significance level.

## 4 RESULTS AND DISCUSSION

### 4.1 Corruption and digitalisation in construction proceedings

Given the role of the construction industry in development (and its size), corruption in this sector is particularly pernicious (Kenny, 2009). The proportion of firms expecting donations in exchange for construction permits is related to the level of complexity and costs of dealing with construction permits, i. e. overly complicated construction rules can also increase opportunities for corruption (World Bank Group, 2009). Firms faced with demands for bribes take approximately 1.5 times longer to obtain a construction permit than firms that have not had to pay bribes. Thus, the present findings suggest that corruption does not increase efficiency (Freund, et al., 2014) (World Bank Group, 2014).

The Eurobarometer asks businesses since 2013 whether anyone in (their own country) has asked for or expected a gift, favour, or extra money from their company for any of the following permits or services. Among the possible answers is an application for a building permit. (Eurobarometer, 2019). Also, the World Bank conducts a survey at the enterprise level on a representative sample of the private sector of the national economy. The survey also measures the percentage of firms that were expected or required to make an informal donation or payment in order to obtain a construction permit. The disadvantage of the survey is that it is not conducted across the board in the same year for all countries, but a selected sample enters the survey each year (World Bank Group). Thus, the difference in methodology is that in the case of the Eurobarometer, a specific list of requests is enumerated, and the respondent is asked to indicate those with which corruption has been linked. In the case of the World Bank survey, however, the respondent is asked specifically about the process of obtaining a building permit. Differences in the methodology of the surveys also cause differences in the results. In the Eurobarometer, as opposed to the World Bank Group, a lower number of firms indicated that the process of obtaining a building permit was associated with corrupt behaviour (% of firms: Italy 47.9% vs. 0.02% or Slovakia 2.6% vs. 0.03%).

To confirm the hypothesis, we used our constructed index of the difficulty of obtaining a building permit. Data from Eurobarometer confirms a positive correlation between the index of the difficulty of obtaining a building permit and the level of corrupt behaviour among EU countries. In 2017, it was at its highest level of 0.52 (moderately strongly correlated). If we averaged the indexes of the difficulty of obtaining a building permit over 4 years (2013, 2015, 2017 and 2019) and averaged the rate of corrupt behaviour over the same years, the calculation of the correlation coefficient yielded a value of 0.5, i. e. the relationship is moderately strongly dependent (H1). However, in the case of using World Bank data for the period 2016-2020 (time due to unavailability of country-specific data), we do not confirm the relationship between the difficulty of obtaining a building permit and the level of corrupt behaviour (H1).

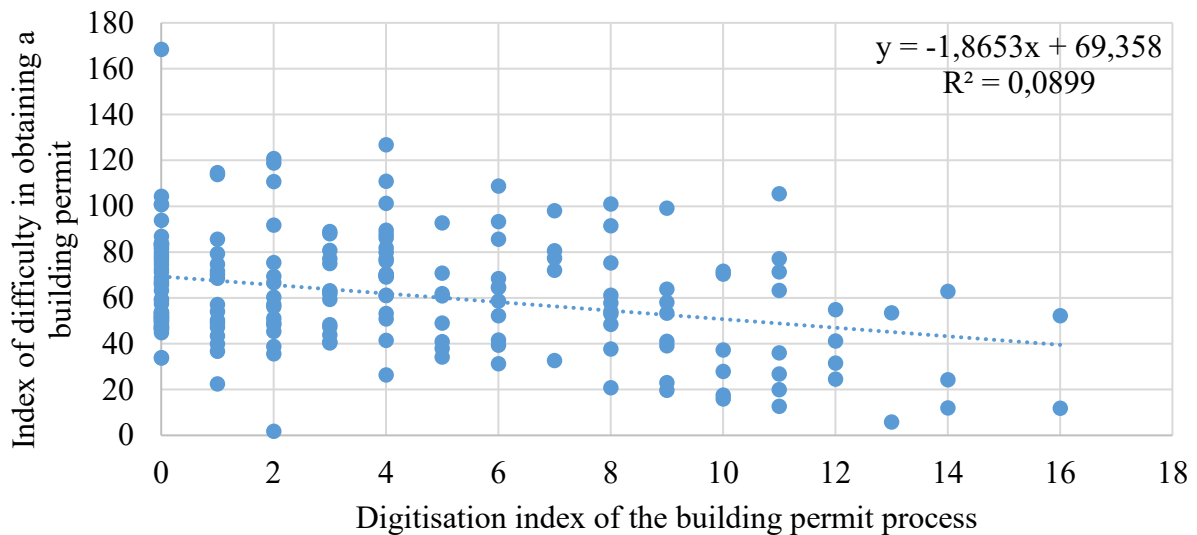
The relationship between the digitisation of the building permit process and corruption was examined only among EU countries, given the availability of data. In this case, the dependence between these variables was not confirmed (H2).

On the one hand, the implementation of ICT in the construction process can reduce corruption and increase overall efficiency, but on the other hand, the ICT procurement process can lead to corrupt behaviour that makes the ICT solution unnecessarily expensive. An example is Slovakia, where the price for an ICT solution has increased from the original proposal of €9.9 million (2010) to €53.6 million (2015). The current proposal foresees a cost of €80.4 million (2021). However, the amount of the proposed solutions is inconsistent with the average cost of procuring an ICT solution among middle- and high-income countries, where investments in the range of €600,000-€20 million are usually required (World Bank Group, 2018).

## 4.2 Digitisation and efficiency of the building permit process

The need to implement an ICT solution and to digitise the process of obtaining a building permit is confirmed by the relationship between the digitisation index of the building permit process and the index of the complexity of obtaining a building permit (procedures, processes and costs required to obtain a building permit from the international ranking Doing Business) (Figure 1). There was also a significant, negative, moderately strong correlation of 0.38 (H3). The regression equation states that if the digitisation index of the process of obtaining a building permit were zero, the index of the difficulty of obtaining a building permit would have a value of 69.358. If the digitisation index of the process of obtaining a building permit is increased by one unit, the index of the difficulty of obtaining a building permit is reduced by 1.8653. Thus, in countries with a high level of digitisation of the process of obtaining a building permit, the difficulty of obtaining a building permit is lower.

Fig. 1 - Relationship between digitisation index of the building permit process and the Building Permit Difficulty Index. Source: own research



Additionally, the correlations show that digitisation of the process of obtaining a building permit is associated with countries that have higher GNI per capita (0.52), the better developed index of e-government (0.67), the index of higher regulatory quality (0.62) or the index of government efficiency (0.64) (H4). In order to further develop the digitisation of public administration and to make the processes of obtaining building permits more efficient, it is therefore necessary to develop the aforementioned aspects as well.

Comparing Doing Business data with data from the Entrepreneur Survey (2016-2020), we find that in 92% of economies the Doing Business data is higher, ranging from 10 to 630 days longer processing time. The difference in question is due to the different measurement methodology, where Doing Business is based on hard data on regulations and the second ranking is based on a survey of entrepreneurs. Due to the different methodology, the correlation between the results of the difficulty of obtaining a building permit (number of days from the survey of entrepreneurs) and the digitisation process of the process of obtaining a building permit is also different than in the previous result with the data from Doing Business.

## 5 CONCLUSION

The article contains the extensive literature review and the results that could be drawn from the available data on the digitalisation of the process of obtaining a building permit. The main limitation of this article is the availability of data in a longer time series. The World Bank has so far only conducted one survey that specifically focused on the digitization of the process of obtaining a building permit, and therefore a more extensive econometric analysis was not possible to show the possible interrelationships between the digitization of the process of obtaining a building permit and other aspects on the overall difficulty of the process of obtaining a building permit. No other organisation or institution has yet collected data so widely and accessibly on the digitisation of the process of obtaining a building permit.

Should data on the digitisation of the building permit process be produced and published in the coming years, further research could be carried out to investigate the impact of changes in the digitisation of the building permit process on the potential change in the difficulty of obtaining a building permit or other aspects immediately related to the process.

As the literature also shows, one of the prerequisites for the efficient functioning of the process of obtaining a building permit is its digitisation. Data confirms that countries that have chosen to digitise their processes in this area have higher levels of efficiency. These can further translate into economic growth, employment, higher foreign investment inflows, government credibility, etc. While the data did not support a relationship between the rate of digitization of the building permit process and digitization through correlation, further research may change this conclusion. Thus, individual countries should focus on efficient digitisation of processes to ensure better competitiveness of their economies. Efficient ICT procurement is a prerequisite to ensure best value for money invested in digitisation of construction permitting processes. International price comparisons of ICT systems procured in the building permit process can be a tool for comparing prices and reducing costs when introducing ICT into the building permit process.

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# CIRCULAR URBAN SYSTEM ACROSS V4 MAIN CITIES FROM THE POINT OF VIEW OF PUBLIC SPACES AND ITS COMPONENTS AS A MODERN TREND FOR COMPETITIVENESS

*Lenka Zemanová, Michal Vávra*

## **Abstract**

Process of urbanization has created one of the biggest challenges facing the planet. Therefore, the issue of urban system has recently attracted attention of many scholars. From the territorial point of view this study examines the capital cities of Visegrad region. The main goal of this study is to investigate public spaces across the V4 capital cities by taking view of environmental, economic, social and technological aspects. The study starts with a brief introduction into urban cities and explaining the important terms related to urbanization. The paper continues with literature review and provides a summary of previous studies which have been done related to this issue. Methodology reveals the main scientific methods and research questions which have been set up to accomplish the main goal. Results of the study show that the highest percentage of total green infrastructure has been recorded in Warsaw (47%) which is above the European average. Following this, we have compared the results of satisfaction survey of inhabitants in the V4 cities when it comes to green spaces parks and gardens. The highest level of satisfaction has been recorded also in Warsaw (83%), even though this city has the lowest number of parks and gardens per inhabitants. The undertaken analyze shows that the highest number of gardens and parks per inhabitants is in Prague (31 m<sup>2</sup>) and Budapest (20 m<sup>2</sup>) with is in accordance with the recommendation of European Commission (9 m<sup>2</sup>). The accessibility of residents within a 400 m walk to public green spaces is the best in Prague (91%).

**Keywords:** *Visegrad capitals, green spaces, green infrastructure, comparative analyze*

## **1 INTRODUCTION**

The linear economic system has been the target of criticism from the public, private, and academic spheres due to its increasing economic or technological demands and the increase in externalities arising from the positive influence it brings. Within the framework of several agreements, a change in the functioning of several countries was established with the aim of changing this trend. In our conditions, Agenda 2030 is used as the most significant application, which sets a fundamental change in several economic, governmental, technological, and social areas, precisely to the elements of the circular economy. Thus, the very aspects of sustainability have become a necessity, which creates the prestige of a given area in a specific country. This itself has an impact on tourism, which is already from the field of congress, but also experiential tourism, which helps in the development and in raising the attractiveness of a country.

Sustainable public spaces have become an essential element of developing cities and towns in European terms from the point of view of modern trends in urbanism, architecture and tourism. Currently, it is estimated that between 2% and 15% of land in city centers in Europe are public spaces, creating added value in physical and social aspects (European Commission, 2022). The perception of the added value of public spaces has increased greenery in European cities over the last 25 years by 38%. This trend subsequently led to the fact that currently, 44% of Europeans live within 300 m<sup>2</sup> of a park or other public space (European Commission, 2022). The World Health Organization (WHO) recommends at least 9 m<sup>2</sup> of open green space for the quality of life of city dwellers (WHO, 2020). Within the European area's framework of urban infrastructure, approximately 40% of the metropolitan area is expected to comprise green urban

infrastructure, which creates 18.2 m<sup>2</sup> of green space per inhabitants. (Zulian et al., 2018; Corbane et al., 2018). This is also one of the critical areas within the framework of the circular economy included in the 2030 Agenda, as well-designed green public spaces can bring several benefits, among which we can have according to following aspects:

- Social aspects (social integration and increased experience factor among residents; improvement of safety and health protection of residents; developing aspects of quality of life),
- Environmental aspects (increasing air quality; ensuring microclimate regulation),
- Technological aspects (sustainable elements of used materials),
- Promotional aspects (self-presentation of the place with the following future effects on the surroundings),
- Cultural aspects (possibilities for cultural life and development of communities).

The correct application of the issue of green public space brings the conditions to the increasing attractiveness of the place, which has also impact on the city. When applying the circular economy, the city will begin to diversify and create investment incentives for several companies doing business in the given area, which is one of the essential elements of sustainable urban development. Therefore, we can begin to perceive the city as a Green City, which is part of the Smart City concept.

The primary goal of this study is to investigate the environmental, technological, economic, or social impact of sustainable public spaces across the V4 capital cities. To achieve the primary goal, we use the extensive analysis of scientific literature, statistical portals, and international evaluation indexes examining sustainability from the point of view of tourism and urbanism, as well as define current trends and challenges in the field of tourism. To fulfil the primary goal, we set several hypothesis and research questions, which help us characterize the environmental, economic, social, or technological aspects regarding comparison of green infrastructure across the V4 capital cities.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

The issue of public spaces and sustainable cities have attracted the attention of many scholars since our planet has become more urban and the majority of population live in the cities. Due to this increasing population, governments are required to figure out and provide solutions how to create future spaces for the citizens. The quality of urban life has been declined by many factors such as congestion, pollution, low quality housing, noise, crime, social fragmentation, and many other factors. Therefore, planners and policymakers face different types of problems and energy-environmental policies have become central to their quest for urban sustainability. Following this, the importance of parks and other public places is magnified. This chapter brings a brief overview of scientific studies which are dealing with this issue on academic level (Perrels, Nijkamp, 2014).

First of all, it is important to mention that majority of the world population lives in the towns and cities. The prognose shows that by the end of 2050 almost 70% of the world population will live in the cities, mostly in Asia (55%), Africa (20%), Latin America (10%), Europe (9%) and North America (6%). Because of this, it is important to focus on public places which provide urban advantage. Urban public cities are useful when it comes to sustain the productivity of the cities, their social cohesion and inclusion, their civic identity and quality of life. Unfortunately, uncontrolled rapid urbanization creates disorderly settlement patterns with dangerously low shares of public space and many cities in developed countries experience currently a dramatic reduce of public space.

From the above-mentioned facts, we can perceive public places as entry points by nature. Through its multi-functional and multi-disciplinary character, public space offers a holistic view of the city including social inclusion, governance, legislation, health, safety, education, climate change, transport, energy, and the urban economy (UN Habitat, 2016). According to Agenda 2030 for Sustainable Development public places present a key tool to achieve the sustainable development goals (NCD Alliance, 2016). The topic of sustainability brings a variety of new concepts and terms like smart city, green city, eco-city, smart urbanism, sustainable neighborhood etc. (Botterro et al., 2019).

UNECE (2016) defines smart sustainable city as an innovative city which uses information and communication technologies and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects. According to Warecam et al. (2013) a Smart City should be able to actively generate smart ideas in an open environment through fostering clusters or open data or developing proper living labs while directly involving citizens in the co-creation process of products and services. Through implementing information and communication technologies into municipal services, cities turn into being more intelligent in their management of resources. Those new types of cities with new technological applications create new business opportunities and a hub for research. Thus, they attract companies, entrepreneurs, and research institutes.

To measure the level of development of sustainable cities there have been increased many city rankings and assessment studies in the recent years because cities are now seen as a leverage point in the quest for global sustainability due to the agglomeration of population in them. City rankings and studies serve as an important planning and evaluation tool for policymakers, city administrators and urban planners to compare different projects and results. Moreover, it is useful tool in terms to help cities to understand how they perform in different dimensions of urban sustainability compared to other cities within the same region and identify areas for improvement (Akande et al., 2019).

Relating to smart cities definition it is important to mention a circular economy which is an important factor to develop them. Circular economy can be characterized by the need to improve the use of resources, by reducing waste and recycling. Under the sustainable development broader circumstances, circular economy becomes one of the important parts of providing resources for the future generations, based on intra and intergenerational solidarity, having as starting points the 3 R (reuse, recirculation, recycling) and extending the lifecycle of products (Aceleanu et al, 2018).

One of the critical attributes of Smart City concepts is the use of digital technologies to solve specific challenges in the field of economic, social and environmental sustainability. Smart cities are characterized by integrating digital technology into the central infrastructure systems of the city. As part of the digital urban infrastructure, it is crucial in the construction of intelligent buildings, transport systems, business material flow, public spaces and services, where, in addition to financial costs, aspects of the use of renewable energy sources, its efficiency and impacts on urban greenery and the health of citizens are key. Thus, sustainable development becomes essential in decision-making processes in preparing Smart City concepts (SBA, 2021). It is mainly used within the framework of priorities and goals that a city or region sets concerning its natural resources, social and technological aspects, public services, the city budget or the necessity of saving input energy. The city will choose its priority areas and technological solutions based on these priorities.

With more significant support for the introduction of digital technologies within cities and the preparation of digital infrastructure, more space will be given to the start-up environment and

small and medium-sized enterprises, which will help the urban environment by increasing the added value, image and quality of services in the city. We can include this concept in local self-government, innovative economy and urban infrastructure (Eckhoff, Wagner, 2017).

In the international evaluation Smart City Index, presented by the World Competitiveness Center IMD research center, the Slovak city was mentioned for the first time among the 109 evaluated cities in the world only in 2017. In 2020, Bratislava was ranked 76th, but in 2021, Bratislava fell by 20 places, to a total of 96th place out of 118 world cities (Smart City Observatory, 2022). This also indicates that the Smart City concept is significantly delayed in Slovakia. The size of the city does not determine the significant level of implementation of Smart City in urban life. Smaller cities often get further in their approach to the concept than some larger, more populous cities.

The Green city concept's primary goal is to create, maintain and apply synergy between the urban area and nature, with the sustainable application of natural elements to the urban infrastructure. Assuming that the urban infrastructure is based on green technologies and sustainable design, it will ultimately positively impact the reduction of the environmental environment, significant shifts in the current lifestyle of the inhabitants, or existing socio-political structures. Several authors, such as the author Klein (2013), explain the close link between government power, urban planners, architects, consulting companies, businesses, and other companies promoting sustainability and the idea of "natural capitalism". This idea combines the market perception of the economic system with the need to encourage and apply strategies for solving environmental problems concerning social, technological and financial possibilities. The author Isenhour (2015) characterizes the current state, when the country has experienced significant economic or population growth since the beginning of the 21st century, with a stop at denser urban infrastructure. The current state, which culminated in the financial and economic crisis, defines the country or cities that can already fully use renewable resources as they reduce the increasing costs for energy due to several consecutive events, among which we can include the war in Ukraine. It is precisely the results of performance in the field of sustainability in a given environment that provide added value that helps further the development of demographic, economic, social, technological, legal or natural factors. Sustainable urbanism is more than just an environmental plan – it is a branding strategy for the 'entrepreneurial city' (Harvey 1989). It promotes cities with high live ability and good public services as needed.

In order to compare the sustainability of the cities, there have been used in many scientific studies the indicator-based approach to access various dimensions of urban smartness and sustainability, aggregate these dimensions and benchmark global cities based on them. There are many indexes included in the studies such as United Nation's City Prosperity Index, The Sustainable City Index, The Cities in Motion Index, The Global Power City Index or The Cities of Opportunities Index. These indexes attempt to benchmark several global, cities using indicators ranging from 17 to 77 in number with various weighting and aggregation methods. From the geographical point of view, there have been specially developed multiple city rankings to benchmark European Cities such as European Smart Cities ranking, European Green City Index, European Green Capital, Europe Quality of Life Index etc. (Akande et al., 2019).

However, from the territorial point of view, the distribution of the smart cities in European Union nowadays presents a large disparity between the Western and Eastern Part. At the country level, the highest number of smart cities has been recorded in UK, Spain, and Italy while in relative numbers Italy, Austria, the Scandinavian countries (Denmark, Norway, Sweden) and some small Eastern countries such as Estonia and Slovenia were the best performers. Following this, one of the most used examples as a good practice in academic literature as a smart city performer comes from Western European countries, for example



Amsterdam which is considered as a first digital city and taken usually as a case study for a successful smart city, Genoa, which emerged as a leader in winning EU funding for smart initiatives proposals, Barcelona, Helsinki, Manchester, Vienna, Thessaloniki etc.

Focusing on Visegrad region and its countries as a main objective of this study (Slovakia, Czech Republic, Hungary and Poland) the situation is different. The results of European Digital City Index, or many other official reports and study show that the Visegrad countries are far away from being leaders in terms of number, scale and scope of ongoing smart initiatives. According to Kollar (2018) the challenges of smart cities from former communist countries are extremely high. He summarizes that smart city in Visegrad region are part of an ongoing process of planning and development, but the concept is not yet fully integrated in management of the cities.

Between the main disadvantages Dameri and Cocchia (2013) consider the fact that most of the cities that are part of the European smart cities network are simply implementing punctually 'smart' initiatives and do not have a clear strategic plan to become smart in all areas of urban life. According to Szczech (2014) Visegrad cities face an ongoing issue regarding good governance and smart approaches in planning documents fail to approach this issue. Following this fact, Cehan et al. (2019) claim that urban planning documents of Visegrad region lack a comprehensive approach in implementing the smart city concept. Even though, there is evidence that they promote smart solutions mostly for transportation and energy sectors, and do not sufficiently cover the aspects related to quality of life and good governance. Because of above mentioned issues of Visegrad countries we are going to focus on providing more-in-depth analyze, status and the main drivers of the issues faced by smart cities that emerged in the Visegrad region.

### 3 METHODOLOGY

The primary goal of this study is to compare green infrastructure across the V4 capital cities by taking the view of environmental, economic, social or technological aspects. Our focus in this research is on the capital cities of the Visegrad region (Bratislava, Prague, Budapest, Warsaw) which represent the core of Central Europe, even though in many studies of scientific literature Visegrad countries can be considered also as part of Eastern Europe. V4 reflects the efforts of the countries of the Central European region to cooperate in a number of areas of common interest throughout Europe.

Before analyzing and comparing the current state of green infrastructure in Visegrad region we are going to provide a brief overview of capital cities regarding their area and population and population density. This information provides the following table.

Tab. 1 - Area and population of capital cities of V4. Source: used data from Worldpopulation review, 2022

City / Parameters	Area (km <sup>2</sup> )	Population	Population density (people per square kilometer)
<b>Bratislava</b>	367,6	439 070	1,169
<b>Prague</b>	496	1 318 085	4,600
<b>Warsaw</b>	517,2	1 794 532	3,372
<b>Budapest</b>	525,2	1 775 207	3,351

There have been used several scientific methods in this study such as induction, deduction, analysis, synthesis, abstraction, and comparison when processing the obtained data or information. As a primary source for literature review we have explored journals, books and proceedings form different kinds of scientific databases such as Web of Science, ResearchGate, Elsevier, Scopus etc. As a search strategy, the title, abstract and keywords were scanned for

smart city and urban spaces related terms. However, the most important for the results was comparative analysis. For processing the qualitative data, we have used several publicly available databases such as Eurostat, Statista.

To provide more-in depth analyze we have set up several partial goals:

- compare the current state of total green infrastructure in the capital cities,
- study the development of survey results of perception the inhabitants with green spaces gardens and parks in 2015 and 2019,
- compare the overall number of parks and gardens per inhabitants with the recommendation of the World Health Organization of green space per inhabitants.

To achieve the primary goal of this study, we have formulated the hypotheses, and research questions. Hypotheses and research questions correspond to a large part of the researched issue of public spaces within V4 capitals. Following the main goal, we have formulated several research questions:

H1: The size of parks and gardens per inhabitants in all V4 capitals is in accordance with the recommendation of the World Health Organization (9 m<sup>2</sup>).

H2: Green spaces in V4 cities create an above-average area per inhabitants compared to the average in the European Union.

H3: The satisfaction of inhabitants is increasing with the increasing number of parks and gardens per inhabitants.

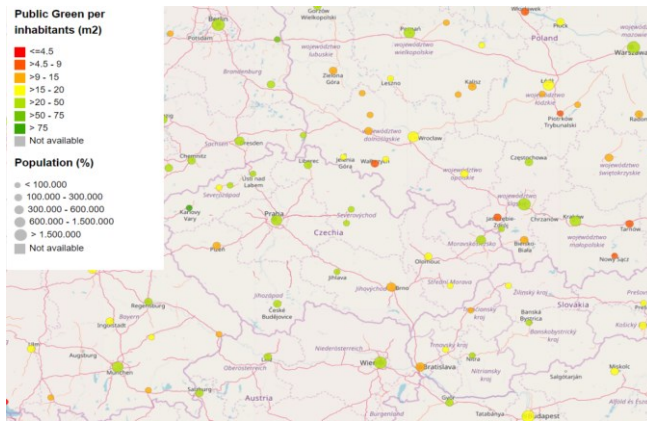
RQ1: What is the current state of green spaces across V4 capital cities?

For better understanding of above-mentioned questions and hypothesis we use graphic representation of results through different tables and figures.

## 4 RESULTS

The V4 countries are actively participating in the fulfillment of the conditions voted for in the framework of strategic development documents in the European Union, among which we include Agenda 2030, Horizon 2020, etc. In these documents, they undertake to achieve 169 goals in 17 categories within the SDG (sustainable development goals), in which the circular economy is practically implemented within countries and cities, with the aim of achieving climate balance, as well as ensuring the subsequent transformation of cities according to the Smart City concept.

In the following comparative analysis, we have focused on several aspects of public green places in capital cities. The following figure shows urban green spaces which are frequently presented as being important for urban quality of life and urban development. According to the latest data, green infrastructure which includes green and blue spaces, f.e. allotments, private gardens, parks, street trees, water, and wetlands, made up on average 42% of the city area in 38 EEA member countries. However, when it comes to Visegrad region, Bratislava (41%), Budapest (36%) and Prague (36%) are below the capital cities average of EEA. The highest values of total green infrastructure can be observed in Warsaw (47%) which is the leader among Visegrad capital cities. For a better display of data for 2019, we decided to express them using the EC-GISCO system for a specific area of V4 countries with data for 2019 in the frame of Figure 1.



City	Public green per inhabitants
Bratislava	13.82 m <sup>2</sup>
Prague	35.71 m <sup>2</sup>
Budapest	16.61 m <sup>2</sup>
Warsaw	28.44 m <sup>2</sup>

Fig. 1 - Public green per inhabitants (m<sup>2</sup>) in V4 for 2019. Source: used data from EC-GISCO, 2022

In comparison with other European capital has Visegrad region a relatively low share of green infrastructure. Average urban tree covers for cities in 38 EEA member and cooperating countries stood at 30%, however among the Visegrad cities only Bratislava and Warsaw are above the average. In comparison with the other cities of 38 EEA member countries, the highest proportion of tree cover can be found in Finland and Norway (European Environment Agency, 2022).

When it comes to publicly accessible green areas, according to the latest data, they form a relatively low share of total green space, estimated at only 3% of the total city area on average. This means that only Bratislava city is 1% below the average. Reason for lower share of green spaces in Visegrad region in comparison with the rest of European cities can be found in the climate, which may discourage local administrations from investing in watering systems for use during the summer months or in periods of drought.

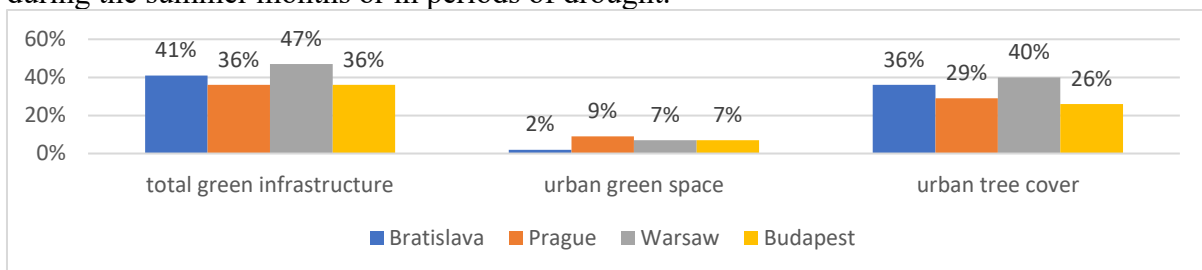


Fig. 2 - Percentage of total green infrastructure, urban green space, and urban tree cover in Visegrad region.

Source: used data from European Environment Agency, 2022

However, when it comes to analyzing the current state of green infrastructure in the cities is important to consider the approach of city inhabitants. Therefore, it has been conducted the perception survey with a goal of collecting impressions about different aspects influencing the quality of life such as healthcare services, green spaces, sport and cultural facilities, public spaces in the city, cinemas in the city, public internet access and internet access at home, city air pollution, noise in the city, presence of foreigners etc. The following figure provides the survey results of perception urban green spaces – parks and gardens in the capital cities in Visegrad region in two years - 2015 and 2019.

As can be seen in the figure, the satisfaction of residents with green spaces has changed over the years within the cities. The perception of satisfaction differs from country to country. Comparison of Visegrad capitals shows that the highest percentage of satisfaction with the public parks and gardens is measured in Warsaw. Despite this fact, the percentage of satisfaction has decreased in 2019, where the value of answer “very satisfied” has decreased in

1.5% and “rather satisfied” in 2.2%. On the other side, the lowest values of percentage have been recorded in Bratislava, however the percentage of satisfaction has improved from 11% to 14.1%. In both cities, Prague and Budapest, the percentage of satisfaction with the green spaces in 2019 (“very satisfied” and “rather satisfied”) has decreased in comparison with the survey conducted in 2015.

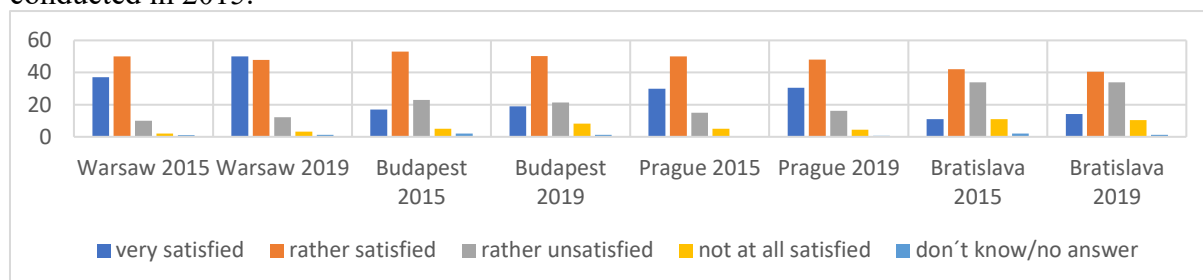


Fig. 2 - Satisfaction with green spaces – park and spaces in capital cities of Visegrad region. Source: used data from Eurostat, 2020

To fully understand the overall level of satisfaction we need to define the number of green spaces in the Visegrad cities, especially gardens and parks. However, due to different city size we need to analyze the data which are internationally comparable. For this purpose, we have quantified the number of parks and gardens per capita. As can be seen from Figure 4, the highest number of parks is measured in Budapest (19.84). The significantly lower number of parks is followed by Prague (8.47), Warsaw (8.32) and Bratislava (6.86). Apart from this, the leader in number of gardens per capita is measured in Prague (22.53). After Prague follows Bratislava (2.86), Warsaw (0.61) and Budapest (0.15).

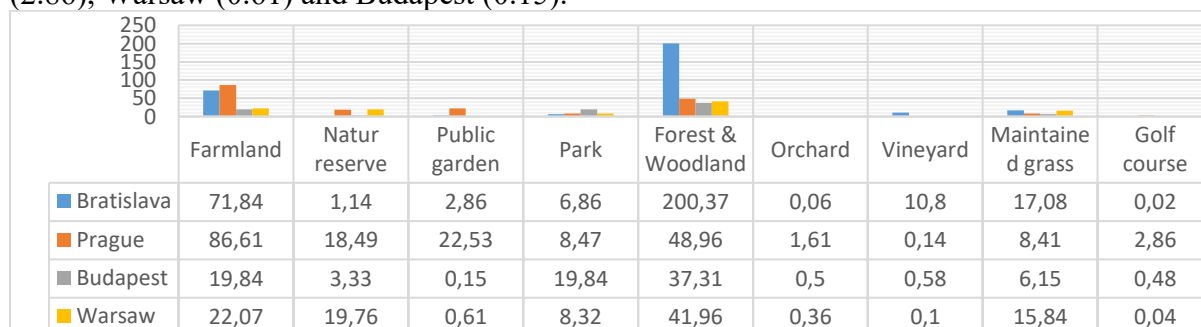


Fig. 3 - The number of green spaces per inhabitants in capital cities of Visegrad region in 2018. Source: own calculations based on data from the Statista, 2022

From the data shown in Figure 4, the state of V4 capital cities in 2018 differs from city to city. The largest share of green open space per inhabitants has been identified in Bratislava (332.99 m<sup>2</sup>), while the most significant share at the level of 200.37 m<sup>2</sup> per person is referred to nature reserves. The second largest share is recorded in the capital of the Czech Republic, where the average amount of green open space per inhabitants is 184.3 m<sup>2</sup>, while up to 86.61 m<sup>2</sup> per person is made up of farms. Next is the capital of Hungary, which according to statistics, provides its inhabitants with 85.82 m<sup>2</sup>, among which roughly 37.31 square meters per person are referred as nature reserves. The last place belonging to Warsaw, which provides its residents with 109.45 m<sup>2</sup>, roughly 41.98 square meters per person, referred to as forest & woodland.

To compare the satisfaction with public spaces we have calculated the number of parks and gardens in capital cities per inhabitants which can be seen in Table 2. However, according to the World Health Organization recommendation, each European should have at least 9 m<sup>2</sup> of open green space for the quality of life of city dwellers (WHO, 2020). Therefore, the following table also compares the difference between current state of parks and gardens and the mentioned

recommendation. As can be seen, all cities except Warsaw fulfill this recommendation. However, it is important to highlight the fact, that green spaces do not include only parks and gardens but also other types of green spaces such as forests, vineyards, nature reserves etc. as can be seen in the previous Figure 4.

Apart from this, the third column contains the sum of positive responses (“very satisfied”, “rather satisfied”) from the above-mentioned survey conducted in 2019 dealing with the satisfaction of inhabitants with the green places (parks & gardens) in the city. As can be seen from the chart there is no relationship between the satisfaction with green places and the number of parks and gardens per inhabitants. For example, the highest percentage of satisfaction was measured in Warsaw, even though Warsaw has the lowest number of parks and inhabitants per capita in 2018.

Tab. 2 Comparison of investigated parameters (2019). Source: Authors own research, 2022

City/Parameter	$\sum$ parks and gardens per inhabitant	Difference of recommendation (9 m <sup>2</sup> )	$\sum$ positive satisfaction (%)
Warsaw	8.93	-0,07	83.3%
Prague	31	+22	78.6%
Budapest	19.99	+10,99	69.2%
Bratislava	9.72	+0,72	54.5%

## 5 DISCUSSION

With the view of achieving results within the framework of the SDGs, within the goal - Urban population without access to green urban areas in their neighborhood, we note a positive trend of filling up to 2030 in 2018, a positive trend toward reaching point 0. The closest to this is Czech Republic, which, compared to 2012, decreased from a value of 2.28 to a value of 0.76 in 2018—followed by Slovakia, which had a value of 4.37 in 2012 to a value of 1.31 in 2018. It is a positive drop of 3.06 points. However, we did not notice this significant trend in other countries, when in the case of Hungary, the decrease was more moderate, from a value of 8.51 in 2012 to 6.77 in 2018. At the same time, Hungary is significantly behind the V4 and the entire European Union in meeting this goal. In the case of Poland, a positive trend was manifested from the original score of 7.37 in 2012 to a value of 5.4 in 2018. The overall results can be seen in Graph 4. To sum up, Slovak Republic ranks 18th out of 34 European countries in meeting the goals, and the Czech Republic ranks 11th, Hungary ranks 21st and Poland ranks 15<sup>th</sup> (Europe Sustainable Development Report 2021, 2022). To understand this issue, it is also necessary to analyse its previous state. For this reason, we focused on selected parameters in the vicinity of green urban areas in their neighborhood from a distance perspective in the year 2018 at the earliest, which are graphically displayed in Table 3, also from an extended perspective (due to data availability) for the urban center or individual V4 countries. These data have been quantified for the year 2012 and can be observed in Table 4.

Tab. 3 Green urban areas across capital cities of V4 in 2018. Source: used data with authors processing from European Commission, 2021

City / Parameter	Population without green urban areas in their neighborhood (% of total population)	share of urban center population having access to less than 1ha of green urban areas within 400 meters walk	share of urban center population having access to green urban areas within 400 meters walk	share of urban center population having access to at least 1ha of green urban areas within 400 meters walk
Prague	9.3	14.7	90.7	85.3
Budapest	40.2	51.9	59.8	48.1
Warszawa	37.2	40.9	62.8	59.1
Bratislava	20.8	30.1	79.2	69.9

The data for the year 2018 show the strong dominance of Prague, which recorded up to 90.7% of the overall status and availability of green urban areas within 400 meters of their residence for their residents. Only 9.3% of residents do not have green urban areas near their residence. This phenomenon is also reflected in another parameter when 85.3% of the population has access to at least 1ha of green urban areas within 400 meters walk. Next is Bratislava, which in 2018 had the availability of green urban areas for its residents within 400 m of their residence at a level of 79.2%. Thus, 1/5 of the population does not have such proximity within Bratislava. This is also accompanied by the fact that 69.9% of residents have access to at least 1ha of green urban areas within 400 meters walk. The worst situation can be observed in Hungary, where only 3/5 of the population has access to green urban areas within 400 m of their residence. However, only 48.1% of the population is within 400 meters of at least 1ha of green urban areas within 400 meters walk. Warsaw achieved similar values as the rest of capital cities. The most significant value was within the population without green urban areas in their neighborhood parameter, as up to 37.2% of residents do not have direct, quick access to green urban areas (European Commission, 2021).

For a better understanding of the current state of public spaces in Visegrad capital cities, we used the Copernicus land monitoring service system, thanks to which we were able to more closely characterize the current state of the number of public spaces built within the V4 capital cities. We have shown the data of individual aspects in the frame of Table 4 and the current map of the countries in the Figure 5.

Tab. 4 Monitoring regions of capital cities V4 in %. Source: used data with authors processing from Copernicus land monitoring service

Parameter/Region	Prague	Budapest	Bratislava	Mazowiecki
Forests	28.48	19.77	44.59	38.18
Shrubland	0	0.2	0	0.01
Herbaceous vegetation	0.54	3.13	1.8	2.56
Herbaceous wetland	0.18	0.2	0.3	0.63
Cropland	42.77	14.09	41.29	52.66
Built-up	27.14	59.49	10.71	5.5
Permanent water bodies	0.63	2.54	1.15	0.46

We have examined-the selected cities to more in-depth analysis from the point of view of their natural conditions. Within the framework of the Prague, we have quantified more than 318.98 km<sup>2</sup> of forests, and 479.2 km<sup>2</sup> of arable land within the Prague region (496 km<sup>2</sup>), or the built-up area of the region is 303.97 km<sup>2</sup>. In turn, the Budapest region (511 km<sup>2</sup>) represents 101.2

km<sup>2</sup> of forests, arable land with an area of 72 km<sup>2</sup>, and built-up areas amounting to 303.99 km<sup>2</sup>. The Bratislava region (1998 km<sup>2</sup>) has 890.91 km<sup>2</sup> of forests, 824.97 km<sup>2</sup> of arable land and 213.99 km<sup>2</sup> of built-up area. On the other hand, the largest region, the Mazowiecki region (35,278 km<sup>2</sup>), has forests on an area of 13,469.14 km<sup>2</sup>, arable land on an area of 18,577.39 km<sup>2</sup>, and the built-up area is on the level of 1940.29 km<sup>2</sup>.



Fig. 4 - Land cover across capital cities V4 in 2019. Source: used data with authors processing from Copernicus Land Monitoring Service, 2022

However, in the recent years (2020, 2021), 67%, of resident population in Bratislava has access to public greenery within 750 meters. Following this, by 2030, it should be increased to the level of 80%. In 2021, the area of green areas is recorded at a value of 138 ha, while Bratislava plans to reach a value of 340 ha by 2030 (MIB, 2022). The plan is to plant more than 25,000 new trees by 2030.

On the other hand, Prague plans to plant 1.5 million trees by 2030. Trees and expected +7 m<sup>2</sup> of the territorial area changed from impervious areas to blue-green infrastructure per 1 thousand inhabitants. In total, 56% of Prague area in 2021 has been covered by trees and grass; a 59% distribution of urban green space and a 29% percentage of the urban area was covered by grass. At the same time, based on the Husqvarna Urban Green Space Index 2021 (HUGSI), there is a 57% percentage of urban green space in Prague; a 59% distribution of urban green space, as well a 29% percentage of urban area covered by grass. Next is the capital of Hungary, which according to statistics, provides its inhabitants with 85.82 m<sup>2</sup>, among which roughly 37.31 square meters per person are referred to as nature reserves. At the same time, according to HUGSI, 46% percentage of urban green space is located in the territory of Budapest; 43% distribution of urban green space, and 12% percentage of the urban area is covered by grass. At the same time, according to HUGSI, there is a 51% percentage of urban green space in the territory of Warsaw, 49% distribution of urban green space, and a 13% percentage of urban area covered by grass (Husqvarna Urban Green Space Index, 2022). Due to the unavailability of data for Bratislava in HUGSI, we have listed the currently available data for the remaining V4 countries. In capital cities of Warsaw and Budapest, we recorded an increase in Warsaw by 2.04% in the availability of green space per inhabitants to 64.84%. On the contrary, we recorded a decrease of 0.96% in Budapest (UN Habitat, 2022). More detailed data can be observed in Table 5.

Tab. 5 Green urban areas across capital cities of V4 in 2021. Source: used data with authors processing from European Commission, 2021

City	urban green space	distribution of urban green space	urban area covered by grass
Prague	57%	59%	29%
Budapest	46%	43%	12%
Warszawa	51%	49%	13%
Bratislava	52%	48%	19%

From the overall perspective for the observed period, we can sum up that capital cities of Visegrad region contribute significantly to the improvement of the situation from the point of view of public spaces and, to a large extent, record a positive growth trend in the fulfilment of the SDGs in the examined area, as well as create sufficient recommended green space due to their urban location for its residents throughout the observed periods. Many other cities have targets, which are aimed at improving green space and access to nature, such as planting 150,000 additional trees, and ensuring every person lives within a 5-minute walk to nature.

## 6 CONCLUSION

In this paper, we focused on applying the perception of the circular economy in green spaces concerning its environmental, ecological, social or technological impact within the capitals of the V4 countries. We used one research question and three hypotheses to fulfil the goal. Through research questions, we pointed out the current state of green spaces in V4 conditions. Using hypotheses, we specifically measured the differences between the V4 countries and the average of the European Union in terms of the availability of greenery per inhabitant and the average recommended greenery per inhabitant. This helped us to achieve the primary goal, which defined the areas just examined in terms of observed phenomena in the circular economy.

**Economic impacts** – Actuality of the need for territorial development based on creating an intersection of social and cultural possibilities and the expectations of the inhabitants, considering current informational and environmental trends. Based on this principle, the cities plan to spend a large amount of direct investment in developing public spaces to make the place more attractive, acquiring its investment potential for cultural life. Currently, the city of Bratislava plans to spend more than €15,264,280 on the infrastructure of public spaces and greenery in 2022. Prague has allocated more than €110,000 for the repair and maintenance of the city's infrastructure. Budapest has a budget similar to Prague, and Warsaw has around €25,500,000 for repairs and urban infrastructure management and environmental protection.

**Environmental impacts** - Environmental principles of the city should lead to a balance between the urbanized environment and the urban landscape. This balance can be achieved by incorporating elements of natural aspects into the urban system. V4 countries offer almost 50% of urban green spaces, while Bratislava offers public green per inhabitant at 13.82 m<sup>2</sup>, Prague at 35.71 m<sup>2</sup>, Budapest at 16.64 m<sup>2</sup> and Warsaw at 28.44 m<sup>2</sup>. At the same time, V4 cities allow citizens access to green urban areas within 400 meters in Prague for 90.7% of citizens, Budapest for 59.8% of citizens, Warsaw for 62.8% of citizens and Bratislava for 79.2% of citizens. At the same time, all examined countries plan to increase this parameter until 2030.

**Social impacts** - The social aspect of public spaces must primarily improve the quality of life of the citizen or the city. At the same time public spaces fulfils several cultural-educational, environmental and technological functions. This is also reflected in the satisfaction with green infrastructure across the V4 cities, where it reached the percentage of satisfaction 83.3% in Bratislava, 78.6% in Prague, 69.2% in Budapest and 54.5% in Warsaw. Also, the planned fulfilment of the SDG goals within the framework of cities will have a solid connection to the



further development of cities to fulfil the climate balance agenda, with its impact on a measurable increase in the quality-of-life index, as well as the satisfaction of citizens.

***Technological impacts*** - Currently, technological possibilities indicate the full use of the perception of the circular economy from the point of view of the use of several sustainable sources, renewable energy and IOT systems to fulfil the need for attractiveness for a wide range of residents of a given city. Offered options for carsharing, bike-sharing, charging stations for various types of devices, or being fed up with current global challenges and trends in regional development. This creates the potential for integrating innovative companies with their products toward the goal of climate balance between urban infrastructure and nature.

The results of this study encourage authors to further investigate this issue from a theoretical and a practical point of view. As the issue of sustainability in the field of urbanism, green spaces have a direct impact on the quality of life within cities, which must be regularly developed to meet the challenges and trends.

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